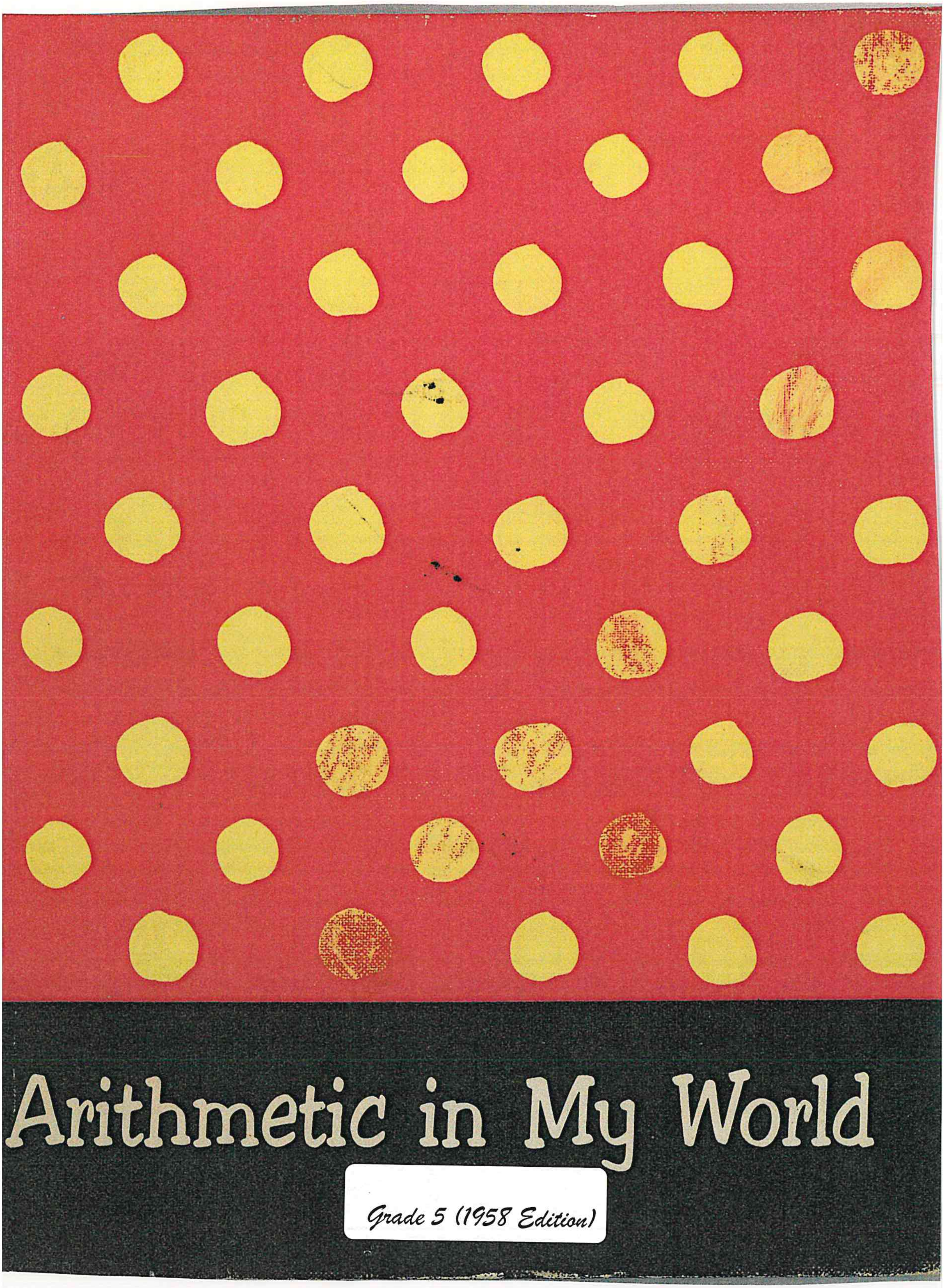

Arithmetic in My World

Grade 5 (1958 Edition)

Arithmetic

IN MY WORLD

by

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Belle Adams
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5

1958

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ARITHMETIC IN MY WORLD

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ILLUSTRATORS

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The authors believe that the learning and teaching of arithmetic is based on child growth. Through the study of many thousands of children and their problems, they have determined how and what children should learn in order to establish desirable growth patterns. They have found that children's problems can be organized into units of work composed of activities which are in reality areas of development.

It should be noted that there are two headings for each unit in the Contents. The first heading names the social situation which the authors have established for each unit of work. The second heading indicates the associated arithmetical concepts which are developed in the unit.

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UNIT 1

Things We Do in School

Can you help your teacher today? What can you do for her? If she asks you to pass out paper to 2 tables of children, do you know how to count the children at each table?

What games do you like to play in school? There is a good one in this unit. Maybe you can learn how to play it if you do not know already. Watch for it!

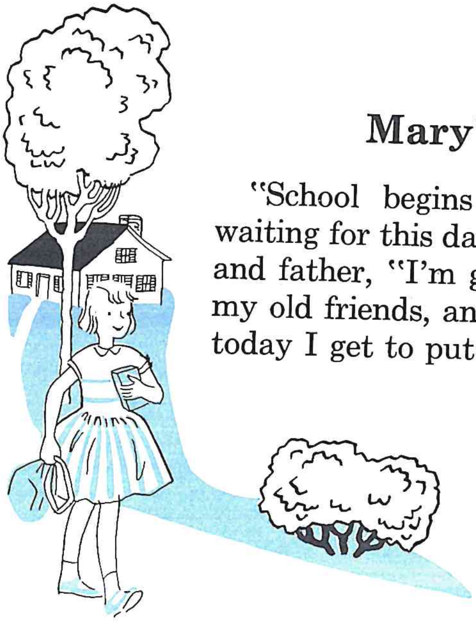
There are some good ideas on what to do when someone in your class has a birthday. When is your birthday? Do you know how long it is until your birthday?

Pete is going to have a watermelon feed for the children in his class. Have any of you ever been to one? It is a lot of fun. You do not have to cut the pieces as large as Pete does when he treats his friends. You see, Pete raises watermelons, so he has lots of them.

How many of you can cook? Did you know that boys cook and bake very well? When some of you boys grow up, you may want to be chefs. Some of the chefs in the large hotels earn very good salaries and get enjoyment from making good food for people to eat.

I suppose all of you want to know how much you have grown and how much more you weigh now than you did when school was out in the spring. Maybe your teacher will weigh you and see how tall you are. You will learn how to tell your height in feet and inches.

Have you ever gone to the bank? Do you have any money in the bank? Would you like to take a trip to a bank? The children in this unit have a bank in their schoolroom. They are the bankers. They made their own bank books and their own bank. If you had a bank in your room, would you ever have any money to put in it? Where and how could you earn money to put in the bank? Do you have an allowance? Could you save some of it?

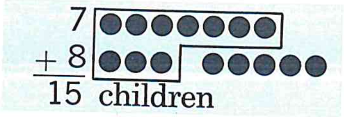


Mary's First Day of School

"School begins today," said Mary. She had been waiting for this day. At breakfast, she said to her mother and father, "I'm glad school is starting. I will see all of my old friends, and there may be some new pupils. And today I get to put on my new shoes and new dress."

Mary took her new pencil box and set out for school. Then, as soon as the bell rang to open school, Miss Brown asked her if she would pass paper to the children sitting at the first 2 tables.

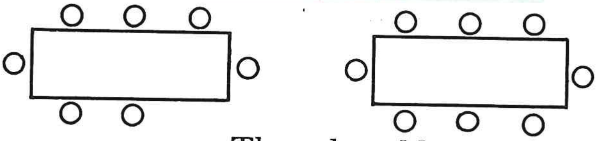
Mary counted all the children at each table. She then added to make sure that she was right. This is how she added:



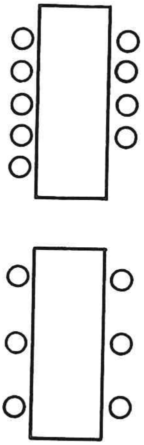
7 + 8 = ?

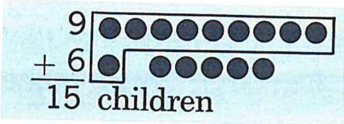
Mary knew that 8 had the parts of 3 and 5. She would need to know this to **build** a ten.

7 + 3 = 10; 10 + 5 = 15.



Then she added again to get the number of children at the other 2 tables:





9 + 6 = ?

Mary built a ten: 9 + 1 = 10. Then 10 + 5 = 15.

Copy these, and show how you can use parts to build 10 and some more:

$$\begin{array}{cccccccccc} 7 & 6 & 5 & 9 & 6 & 8 & 7 & 6 & 7 & 9 \\ \underline{+9} & \underline{+8} & \underline{+6} & \underline{+6} & \underline{+7} & \underline{+3} & \underline{+8} & \underline{+9} & \underline{+5} & \underline{+8} \end{array}$$

Do You Have to Build Tens in Addition?

There is a large number of addition facts you should know right off. If you know them, your work in adding will be easier and quicker. Try these to see if you know them at sight. (If you do not, build 10 and some more. This will help you to remember the answers the next time you want to do them.)

3	8	7	7	6	7	5	9	8	9	8
+9	+3	+9	+6	+4	+5	+6	+6	+7	+8	+5

4	5	9	7	4	9	5	6	8	3	6
+8	+7	+5	+8	+7	+2	+8	+9	+4	+8	+5

5	9	6	8	4	8	9	7	2	9	8
+9	+7	+7	+9	+9	+8	+3	+7	+9	+9	+6

1. If Mary found 9 sheets of paper in one pile and 4 in another, would this be enough so that each child in a group of 15 would have 1 sheet each? Why?

2. Harry doesn't know how many 9 and 7 are. If he knows $9 + 9 = 18$, can he use this answer to help him find $9 + 7$? How?

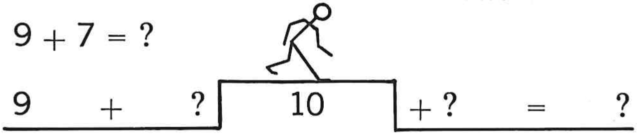
3. 10 and how many more make 15?

4. What number do you add to 9 to give 16?

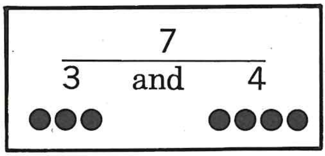
5. You say you **bridge** a ten when two numbers total more than ten. You go from a number *less* than ten to a number in the teens (six*teen*, seven*teen*, and so forth).

Find the answer for the exercise below:

$9 + 7 = ?$



6. Make as many more pairs of groupings for the number 7 as you can.



Mary's Problem of Two-Place Numbers

You remember that Mary had 15 children at two tables and 15 at two other tables. She wanted to know how many children there were altogether because Miss Brown asked her to give a reading book to each child. She could find out by counting them, but she thought addition would be a better way.

$$\begin{array}{r} 15 \\ +\ 15 \\ \hline \end{array}$$

Mary used counters to show the children in the class what it means to add numbers like these. She said, "You know that 15 is 10 and 5. I'll use counters first, like this:

15 = 10 + 5 = |||||||||| + |||||
10 ones 5 ones

"I will put a rubber band around the group of 10 ones. They are all ones because I had to count them one at a time. Now they look like this:"

15 = 10 + 5 = ┼┼┼┼┼┼┼┼┼┼ + |||||
10 ones 5 ones

Remember a ten is equal to 10 ones. 10 ones = 1 ten. The 1 in 15 is in tens place, and the 5 is in ones place.

Then Mary added this way:

tens ones
15 = ▯ ||||| or 1 ten and 5 ones
+ 15 + ▯ ||||| 1 ten and 5 ones
30 ▯ ▯ |||||||||| 2 tens and 10 ones
or or
▯ ▯ ▯ 3 tens and 0 ones = 30. Why?

1. What place does the 4 hold in the number 45? What place does the 5 hold?

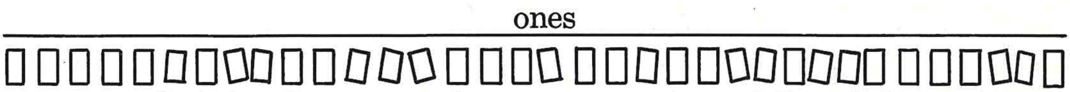
2. How many ones are there in 4 tens?

3. Add by first drawing a picture to show your work:

16	23	46	14	17	32	76	12
16	18	12	28	16	49	18	25

Practice Work

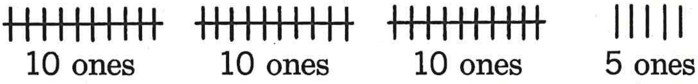
1. Here are the pieces of tagboard that the teacher put on a desk. How many are there?



It is hard to count these one at a time. What did you do to keep from getting mixed up?

Count them by 2's, and see how many there are.

Look at them now. Grouping helps to count, doesn't it?



There are ? in all. This means there are ? tens and ? ones.

2. Draw 16 x's. Draw a circle around 10 of them. How many tens and how many ones could you make from them?

3. Draw 22 circles. Then make as many groups of 10 ones as you can from them. Do this by drawing a circle around each of the groups of 10 ones.

Do you have as many tens as the figure in 22 says there should be? Which figure tells the number of tens? How many tens are there?

4. Count these x's by tens:

x x x x x x x x x x x x x x x x x x x x x x x x x x
x x x x x x x x x x x x x x x x

5. Tell why these are true:

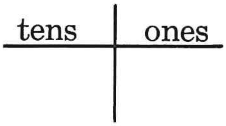
56 = 5 tens and 6 ones
56 = 4 tens and 16 ones
56 = 3 tens and 26 ones
56 = 2 tens and 36 ones
56 = 1 ten and 46 ones
56 = fifty-six ones

6. Using the figures that you see in the following numbers, tell how many tens and how many ones there are in each number:

33 56 71 12 67 15 90 88 49

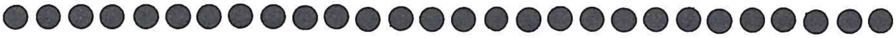
Working with Tens and Ones

1. Put some tens counters on the left side of your desk. Then, put some ones counters on the right side of your desk.



How many tens do you have? How many ones? What number tells you how many tens and ones there are?

2. Count the circles below. Then write tens and ones in figures to show how many there are:



3. What happened to the groups of 10 ones in this chart?

Does this remind you of what would happen if you were working with money? What coin has the value of 10 pennies?

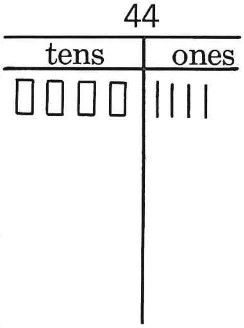
32

tens	ones
1	~~10~~
1	~~10~~
1	~~10~~
	2
3 tens	2 ones

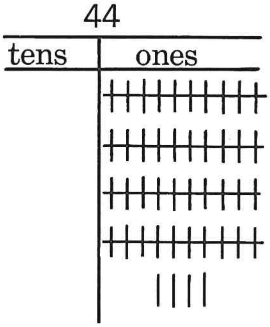
4. Make 30 x's. Now draw circles around groups to show how 3 tens have a value of 30 ones.

5. Make two charts like this, using the number 44. In **a**, change the 4 tens to 40 ones. In **b**, place tens counters in the left column to show the 4 tens.

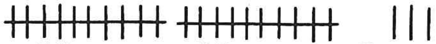
a.



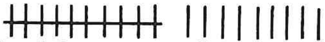
b.



6. For what two-place numbers do the groups below stand? Write them.

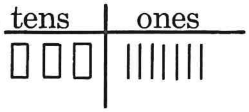


a. 10 ones 10 ones 3 ones

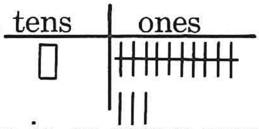


b. 10 ones 9 ones

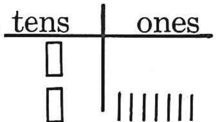
c.



d.



e.



7. Write tens and ones in as many ways as you can to show the value 48.

Let's Add

Add by building tens:

a.

$$\begin{array}{r} 7 \\ 8\ \bullet\bullet\bullet\quad\bullet\bullet\bullet\bullet\bullet \\ \underline{+\,4} \\ 19 \end{array}$$

7 + 8 = 7 + 3 + 5 = 10 + 5 = 15 (1 ten and 5 ones).

15 + 4 = 19 (1 ten and 5 ones + 4 ones).

Write 9 in ones place and 1 in tens place in the answer. Why?

b.

$$\begin{array}{r} 15 \\ \underline{+\,18} \\ 33 \end{array}$$

Add the ones first: 5 + 8 = 5 + 5 + 3 = ?; 5 + 5 + 3 = 10 + 3 = 13. Write 3 in ones place in the answer, and hold the 1 ten for the tens column.

Add the tens: 1 ten + 1 ten = 2 tens. 2 tens + 1 ten (held) = 3 tens. Write 3 in tens place in the answer.

Add by using addition facts (think the tens and ones):

a.

$$\begin{array}{r} 8 \\ 6 \\ \underline{+\,5} \end{array}$$

8 + 6 = 14 (1 ten + 4 ones); 14 + 5 = ? 14 + 5 = 1 ten + 4 ones + 5 ones = 1 ten + 9 ones = 19. Write the figures in their right places in the answer.

b.

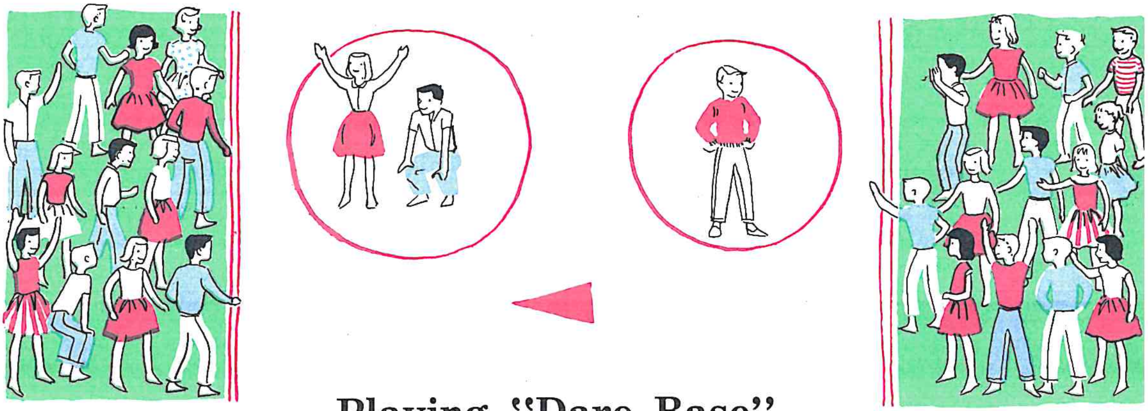
$$\begin{array}{r} 34 \\ \underline{+\,48} \end{array}$$

4 + 8 = 12, or 1 ten and 2 ones. Write 2 in ones place in the answer, and hold the 1 ten. 3 tens + 4 tens = 7 tens. 7 tens + 1 ten (held) = 8 tens. Write 8 in tens place in the answer.

Add, **1**, building tens and **2**, using addition facts:

$$\begin{array}{rrrrrrrrrr} 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 5 & 6 \\ 9 & 8 & 7 & 8 & 5 & 5 & 4 & 8 & 5 & 9 \\ \underline{7} & \underline{5} & \underline{6} & \underline{4} & \underline{8} & \underline{5} & \underline{7} & \underline{2} & \underline{5} & \underline{5} \end{array}$$

$$\begin{array}{rrrrrrrrr} 47 & 42 & 34 & 27 & 19 & 35 & 28 & 47 & 36 \\ \underline{15} & \underline{28} & \underline{27} & \underline{36} & \underline{28} & \underline{37} & \underline{17} & \underline{27} & \underline{58} \end{array}$$



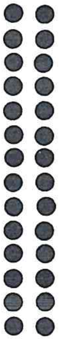
Playing "Dare Base"

Miss Brown told the children how to play an exciting game called "Dare Base." To play the game, the 28 children must be divided into 2 equal teams. Several children showed how they would do the division:

Ken's Way:

Ken used his counters to show how he would put one child in one line and the next child in the other line until all the children were on one team or the other.

Are the groups the same size? How many children are on each team?



George's Way:

George said, "I wish I knew right off what half of 28 is, but I don't know. I *do* know that 12 and 12 are 24. But I have 4 left."

$$\begin{array}{ccc} & 28 & \\ \hline 12+2 & + & 12+2 \end{array}$$

How many are 14 and 14?

Cynthia's Way:

Cynthia said, "There are 2 tens and 8 ones in 28. I will put 10 on each team. Then I will divide the 8, so there will be 4 on each team."

How many children will there be on each of the teams?

Hal's Way:

Hal knew that 15+15=30; 30 is 2 more than 28. So he took 1 away from each 15.

$$\begin{array}{ccc} & 30 & \\ \hline 15 & + & 15 \\ & 28 & \\ \hline 15-1 & + & 15-1 \\ (14) & & (14) \end{array}$$

How many are 14 + 14?

Knowing Groups by Knowing Their Parts

The next day only 16 children wanted to play the game. The children played all during recess. When the bell rang, there were still 9 children behind the bases. How many children were free?

$$\begin{array}{r} 16 \\ -\ 9 \\ \hline \end{array}$$

If you subtract by using counters, it will look like this:

<table>
<tr><th>tens</th><th>ones</th></tr>
<tr><td>□</td><td>||||||</td></tr>
<tr><td>−</td><td>|||||||||</td></tr>
</table>

or

$$\begin{array}{r} \text{||||||||||||||||} \\ -\ \text{|||||||||} \\ \hline \text{|||||||}=7 \end{array}$$

You cannot take 9 ones from 6 ones. Use the ten to get more ones. 1 ten = 10 ones. Then 10 ones and 6 ones = 16 ones. Prove it with your counters.

Now you can subtract the ones:
9 ones from 16 ones = 7 ones.

Can you do the subtraction in numbers? If you do not know 16 − 9 = 7 right off, you could think this way:

$$\begin{array}{r} 16 \\ -\ 9 \\ \hline \end{array} = \begin{array}{r} 1 \text{ ten} + 6 \text{ ones} \\ -\qquad 9 \text{ ones} \\ \hline \end{array} = \begin{array}{r} 10 \text{ ones} + 6 \text{ ones} \\ -\ 9 \text{ ones} \qquad \\ \hline \end{array} \quad \text{or} \quad \begin{array}{r} 10 + 6 \\ -\ 9 \qquad \\ \hline 1 + 6 = 7 \end{array}$$

Some children think this way until they can remember the teens subtractions:

$$\begin{array}{r} \\ 16 \\ -\ 9 \\ \hline \end{array} = \begin{array}{r} {\scriptstyle 10} \\ 6 \\ -\ 9 \\ \hline \end{array} = \begin{array}{r} {\scriptstyle 9+1} \\ 6 \\ -\ 9 \\ \hline \end{array} = \begin{array}{r} {\scriptstyle \cancel{9}+1} \\ 6 \\ \cancel{9} \\ \hline 7 \end{array}$$

Tell why this is correct.

See if you know these. You may use parts of 10 to help you.

$$\begin{array}{r} 14 \\ -\ 6 \\ \hline \end{array} \quad \begin{array}{r} 16 \\ -\ 7 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ -\ 7 \\ \hline \end{array} \quad \begin{array}{r} 14 \\ -\ 5 \\ \hline \end{array} \quad \begin{array}{r} 11 \\ -\ 3 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ -\ 4 \\ \hline \end{array} \quad \begin{array}{r} 11 \\ -\ 9 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ -\ 7 \\ \hline \end{array} \quad \begin{array}{r} 15 \\ -\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 11 \\ -\ 2 \\ \hline \end{array} \quad \begin{array}{r} 16 \\ -\ 9 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ -\ 8 \\ \hline \end{array} \quad \begin{array}{r} 14 \\ -\ 7 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ -\ 8 \\ \hline \end{array} \quad \begin{array}{r} 14 \\ -\ 9 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ -\ 4 \\ \hline \end{array} \quad \begin{array}{r} 14 \\ -\ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 17 \\ -\ 9 \\ \hline \end{array} \quad \begin{array}{r} 16 \\ -\ 8 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ -\ 5 \\ \hline \end{array} \quad \begin{array}{r} 11 \\ -\ 6 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ -\ 9 \\ \hline \end{array} \quad \begin{array}{r} 11 \\ -\ 8 \\ \hline \end{array} \quad \begin{array}{r} 17 \\ -\ 8 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ -\ 9 \\ \hline \end{array}$$

Using Tens and Ones in Subtraction

1. Subtract by writing the tens and ones:

$$\begin{array}{r} 48 \\ -\ 23 \\ \hline \end{array} = \begin{array}{r} 4 \text{ tens and } 8 \text{ ones} \\ -\ 2 \text{ tens and } 3 \text{ ones} \\ \hline ? \text{ tens and } ? \text{ ones} = ? \end{array}$$

$$\begin{array}{r} 76 \\ -\ 49 \\ \hline \end{array} = \begin{array}{r} 7 \text{ tens and } 6 \text{ ones} \\ -\ 4 \text{ tens and } 9 \text{ ones} \\ \hline \end{array} = \begin{array}{r} 6 \text{ tens and } 16 \text{ ones} \\ -\ 4 \text{ tens and } \ \ 9 \text{ ones} \\ \hline ? \text{ tens and } \ \ ? \text{ ones} = ? \end{array}$$

Why can you do this in subtraction?

$$\begin{array}{r} 82 \\ -\ 36 \\ \hline \end{array} = \begin{array}{r} \overset{7\,10}{\cancel{8}2} \\ -\ 36 \\ \hline \end{array} = \begin{array}{r} \text{tens} \\ 7 \\ -\ 3 \\ \hline 4 \end{array} \qquad \begin{array}{r} \text{ones} \\ 6 + 4 + 2 \\ -\ 6 \qquad \\ \hline 6 \end{array} = 46$$

Can you think "using a ten" when you need more ones?

$$\begin{array}{r} 64 \\ -\ 47 \\ \hline 17 \end{array}$$

You cannot take 7 ones from 4 ones. Use a ten and you will have 14 ones. Why?

14 − 7 = 7. Write 7 in ones place in the answer.

You used a ten, so 4 tens from 5 tens = 1 ten. Write 1 in tens place in the answer.

If you do not know that 14 − 7 = 7, you can think:

$$\begin{array}{l} 10 + 4 \\ -\ 7 \\ \hline 3 + 4 = 7 \end{array}$$

2. Write tens and ones in these subtractions:

$$\begin{array}{rrrrrrrrr} 36 & 24 & 37 & 48 & 37 & 20 & 55 & 90 & 43 \\ -\ 18 & -\ 9 & -\ 25 & -\ 19 & -\ 28 & -\ 13 & -\ 16 & -\ 36 & -\ 17 \\ \hline \end{array}$$

Subtract without writing tens and ones:

3.

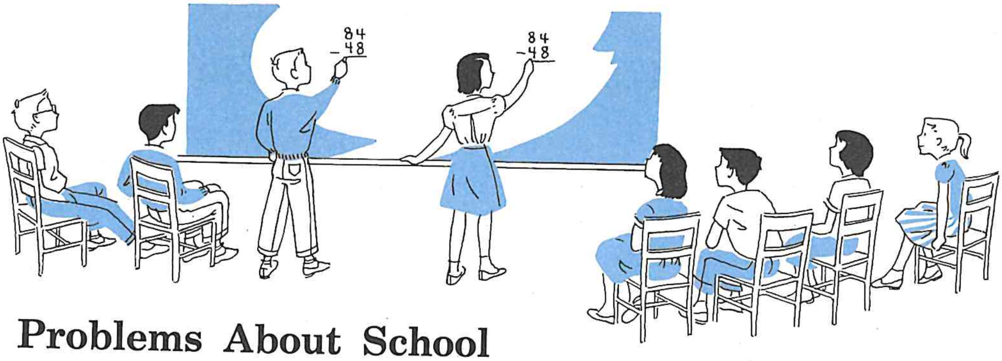
$$\begin{array}{rrrrrrrrr} 14 & 61 & 34 & 73 & 51 & 42 & 65 & 50 & 47 \\ -\ 9 & -\ 48 & -\ 16 & -\ 49 & -\ 26 & -\ 18 & -\ 39 & -\ 26 & -\ 28 \\ \hline \end{array}$$

4.

$$\begin{array}{rrrrrrrrr} 82 & 30 & 76 & 56 & 40 & 25 & 43 & 17 & 26 \\ -\ 49 & -\ 28 & -\ 39 & -\ 38 & -\ 32 & -\ 7 & -\ 17 & -\ 9 & -\ 17 \\ \hline \end{array}$$

5.

$$\begin{array}{rrrrrrrrr} 62 & 22 & 53 & 41 & 60 & 25 & 41 & 20 & 34 \\ -\ 27 & -\ 6 & -\ 26 & -\ 36 & -\ 40 & -\ 6 & -\ 14 & -\ 5 & -\ 19 \\ \hline \end{array}$$



Problems About School

These are some of the problems the fifth graders brought to class. Their classmates are going to help them find the answers. See if you can find the answers, too.

1. If 26 children are playing the game of dare base and all are free except 8, how many children are free?

2. Miss Brown had 30 children in her class. If 14 of them were boys, how many were girls?

3. When Friday came, Joe still had 45¢ of his weekly allowance. If he spent 26¢ for his lunch, then how much did he have left?

4. Sam and Dan wanted to play marbles at recess time. Sam had 27 marbles and Dan had 19. How many did they have altogether?

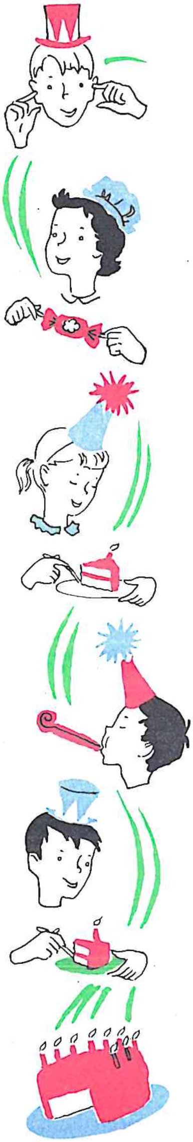
5. Which is more, a quarter or 3 dimes and 3¢? How much more?

6. Miss Brown's and Miss Ray's classes want to have a picnic in the park after school. How many rolls must they buy so each child can have 1 roll, if Miss Brown's class has 26 pupils present and Miss Ray's has 27 present?

7. If you take 4 tens and 8 ones from 8 tens and 4 ones, what number will show how much you have left?

8. How would you use tens and ones in subtracting 47 from 80? What is the answer?

9. School began this year on Tuesday, the 7th of September. There are 30 days in the month. If you take out the Saturdays and Sundays for the next 3 week-ends, how many schooldays will there be in the month?



Happy Birthday to You

A birthday is a very special day. It is your day! Halloween is fun, but it is a day for everyone. The Fourth of July is so much fun, and so are New Year's and Valentine's Day. But these days are for everyone.

The children and their teacher talked about what they could do when someone in their room had a birthday. Here are the things that they are going to do:

1. Sing "Happy Birthday" to him or her.
2. Let the child choose the games to play that day.

It is Mark's job to find out who have birthdays during this month. Do you see how he has marked the days for the different birthdays?

September

S	M	T	W	Th	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	㉔	25	26
27	28	㉙	30			

Find out which children in your class have birthdays this month. Then mark the dates on the room calendar.

1. If today is the 10th of September, how many days is it until Henry's birthday on September 24?

2. How many weeks, counting today, is it until Henry's birthday? How many days more than the full weeks are there?

3. Find how many weeks and how many days it is from the 10th until the end of the month.

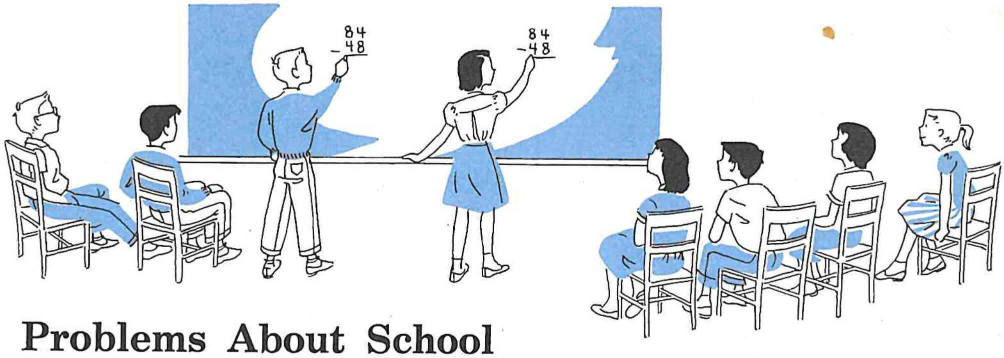
4. Mark's birthday is in November. He counted the days and found that there were 56. How many weeks is it until his birthday? Use these ways to find how many weeks there are in 56 days:

$$\begin{array}{rl} 56 \text{ days} & \\ -\ 7 \text{ days} & = 1 \text{ week} \\ \cline{1-1} 49 \text{ days} & \end{array}$$

Finish the subtraction.

$$7\overline{)56} = \begin{array}{l} \quad\ 5 + ? \quad = \quad ? \quad \text{weeks} \\ 7\overline{)35 + 21} \end{array}$$

Finding a Division Fact



Problems About School

These are some of the problems the fifth graders brought to class. Their classmates are going to help them find the answers. See if you can find the answers, too.

1. If 26 children are playing the game of dare base and all are free except 8, how many children are free?

2. Miss Brown had 30 children in her class. If 14 of them were boys, how many were girls?

3. When Friday came, Joe still had 45¢ of his weekly allowance. If he spent 26¢ for his lunch, then how much did he have left?

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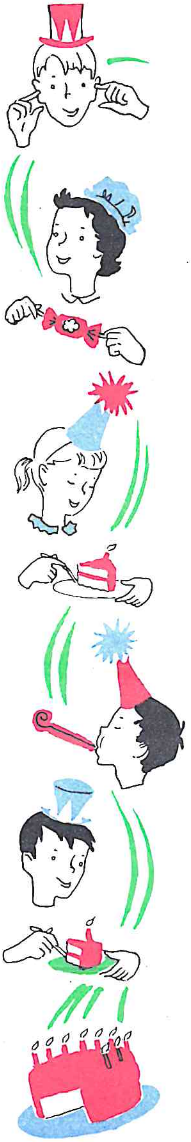

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2. Let the child choose the games to play that day.

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September

S	M	T	W	Th	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	㉔	25	26
27	28	㉙	30			

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2. How many weeks, counting today, is it until Henry's birthday? How many days more than the full weeks are there?

3. Find how many weeks and how many days it is from the 10th until the end of the month.

4. Mark's birthday is in November. He counted the days and found that there were 56. How many weeks is it until his birthday? Use these ways to find how many weeks there are in 56 days:

$$\begin{array}{r} 56 \text{ days} \\ \underline{-\ 7 \text{ days}} = 1 \text{ week} \\ 49 \text{ days} \end{array}$$

Finish the subtraction.

$$\begin{array}{lcl} & & 5 + \ ? \ = \ ? \text{ weeks} \\ 7\overline{)56} & = & 7\overline{)35 + 21} \end{array}$$

Some Ways of Discovering Number Stories

Do you remember what number stories are? These are stories because you can read them: Four groups of 6, or 24, divided into four equal parts gives a group of 6 in each part.

$$4\overline{)24}$$

$$\begin{array}{r} 6 \\ \times\, 4 \\ \hline \end{array} \qquad \begin{array}{r} 6 \\ 6 \\ 6 \\ +\, 6 \\ \hline \end{array} \qquad \begin{array}{r} 24 \\ -\, 6 \\ \hline 18 \\ -\, 6 \\ \hline 12 \\ -\, 6 \\ \hline 6 \\ -\, 6 \\ \hline 0 \end{array}$$

1. Write all the number stories that you can see in these:

a.

$$\begin{array}{c} 32 \\ \hline 16 \quad + \quad 16 \\ \hline 8+8 \quad + \quad 8+8 \\ \hline [4+4]+[4+4]+[4+4]+[4+4] \end{array}$$

Two 16's = ?
Four 8's = ?
Eight 4's = ?

b.

$$\begin{array}{c} 45 \\ \hline 15 \quad + \quad 15 \quad + \quad 15 \\ \hline \boxed{?}+\boxed{?}+\boxed{?} \quad \boxed{?}+\boxed{?}+\boxed{?} \quad \boxed{?}+\boxed{?}+\boxed{?} \end{array}$$

Three 15's = ?
Nine ? = 45

c.

$$\begin{array}{c} 64 \\ \hline 32 \quad + \quad 32 \\ \hline \boxed{\ ?\ }+\boxed{\ ?\ }+\boxed{\ ?\ }+\boxed{\ ?\ } \\ \boxed{?}+\boxed{?}+\boxed{?}+\boxed{?}+\boxed{?}+\boxed{?}+\boxed{?}+\boxed{?} \end{array}$$

Two 32's = 64
Four ? = 64
Eight ? = 64

2. Find how many groups of 7 there are in 35 by using 10 + 10 + 10 + 5.

3. Do you see 8 groups of 9 in 72 by using 72 = 45 + 27? Show how you did it.

4. How can you find the number of groups of 6 in 42 if you know there are 6 groups of 6 in 36?

5. Write down all the ways you see to find the equal parts of 36.

6. How many ways can you divide 48 into groups of equal size?

7. Show that there are 8 groups of 8 in 64 by using 64 = 32 + 32.

Practice in Finding Multiplication and Division Facts

A. How many 6's are there in 48? $6\overline{)48} = ?$

You may know the answer, but it is good practice to work it out by parts because there may be facts which you do not know.

Do you see this: $\begin{array}{l} \qquad\qquad 5 + \;\; 3 = 8 \\ 6\overline{)48} = 6\overline{)30 + 18} \end{array}$ $\qquad \begin{array}{r} 6 \\ \times 8 \\ \hline 48 \end{array}$

B. How many 7's in 63? $7\overline{)63} = ?$ $\quad 7\overline{)63} = 7\overline{)35 + 28} = ?$

Of course, you will always have to choose parts which give you facts you know. If you know how many 7's in one part such as 35, you can subtract 35 from 63 to find the other part which is 28. How many 7's in 28?

C. Could you find the number of 9's in 63 by using:

$9\overline{)63} = 9\overline{)6 \text{ tens} + 3 \text{ ones}} = 9\overline{)10 + 10 + 10 + 10 + 10 + 10 + 3}$?

Use parts to find these facts:

	a.	b.	c.
1.	$6\overline{)24}$ $\begin{array}{r} 6 \\ \times ? \\ \hline 24 \end{array}$	$3\overline{)21}$ $\begin{array}{r} 3 \\ \times ? \\ \hline 21 \end{array}$	$5\overline{)25}$ $\begin{array}{r} 5 \\ \times ? \\ \hline 25 \end{array}$
2.	$8\overline{)32}$ $\begin{array}{r} 8 \\ \times ? \\ \hline 32 \end{array}$	$9\overline{)45}$ $\begin{array}{r} 9 \\ \times ? \\ \hline 45 \end{array}$	$7\overline{)42}$ $\begin{array}{r} 7 \\ \times ? \\ \hline 42 \end{array}$
3.	$5\overline{)40}$ $\begin{array}{r} 5 \\ \times ? \\ \hline 40 \end{array}$	$9\overline{)72}$ $\begin{array}{r} 9 \\ \times ? \\ \hline 72 \end{array}$	$3\overline{)27}$ $\begin{array}{r} 3 \\ \times ? \\ \hline 27 \end{array}$
4.	$7\overline{)49}$ $\begin{array}{r} 7 \\ \times ? \\ \hline 49 \end{array}$	$7\overline{)28}$ $\begin{array}{r} 7 \\ \times ? \\ \hline 28 \end{array}$	$8\overline{)56}$ $\begin{array}{r} 8 \\ \times ? \\ \hline 56 \end{array}$
5.	$6\overline{)30}$ $\begin{array}{r} 6 \\ \times ? \\ \hline 30 \end{array}$	$5\overline{)40}$ $\begin{array}{r} 5 \\ \times ? \\ \hline 40 \end{array}$	$6\overline{)54}$ $\begin{array}{r} 6 \\ \times ? \\ \hline 54 \end{array}$

Using Multiplication Facts

Miss Adams is going to have the children play games today. There will be 3 teams with 16 children on each team. How many children will play games?

$$\begin{array}{r}16\\ \times 3\\ \hline\end{array} = \begin{array}{c}\text{1 ten and 6 ones}\\ \times 3\\ \hline \text{3 tens and 18 ones}\end{array} = \text{4 tens and 8 ones. Why?}$$

What number do you get from 4 tens and 8 ones?

Can you do the multiplication 3 × 16 by thinking the tens and ones instead of writing them? Let's try:

$$\begin{array}{r}16\\ \times 3\\ \hline 8\end{array}$$

You think: 3 × 6 ones = 18 ones. 18 ones = 1 ten and 8 ones. Write 8 in ones place in the answer, and hold the 1 ten.

This is what it means to hold a number: When a ten and 8 ones are made from 18 ones, the 1 ten is then held so that all the tens can be put together. In multiplication, the held ten is added after the tens in the number are multiplied. Some people call this carrying.

Let's finish the problem. You are ready to multiply the tens:

$$\begin{array}{r}16\\ \times 3\\ \hline 48\end{array}$$

3 × 1 ten = 3 tens. Then 3 tens + 1 ten (the ten you held) = 4 tens. Write 4 in tens place in the answer.

The answer is 4 tens and 8 ones, or 48.

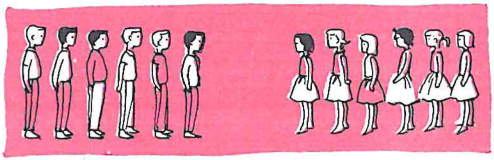
Check your answer by addition: 16 + 16 + 16 = ?

1. Multiply and check by addition. Write the names of the places:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
16	15	17	12	14	24	15	27
× 4	× 2	× 2	× 4	× 3	× 3	× 3	× 2

2. Multiply and check by addition. Think the names of the places:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
43	12	22	32	47	39	37	28
× 2	× 4	× 4	× 3	× 2	× 2	× 2	× 4



Folk Dancing

1. There are 32 children in the fifth grade. Can everyone dance if the children are divided into squares of 8 children each? $8\text{ ones}\overline{)32\text{ ones}} = ?$

2. The children like to dance the Virginia Reel. Divide the children equally into two groups.

$2\overline{)32} = 2\overline{)3\text{ tens and }2\text{ ones}} = 2\overline{)2\text{ tens and }12\text{ ones}}$

3. Nat counted the couples on the floor. How many couples are there in 32 children? $2\text{ ones}\overline{)32\text{ ones}} = 2\text{ ones}\overline{)16\text{ ones and }16\text{ ones}} = ?$,

or $2\text{ ones}\overline{)20\text{ ones} + 12\text{ ones}} = ?$.

4. The children wanted to do the Irish Lilt. It takes groups of 4 children to do this dance. Can all of the 32 children get in the dance?

5. Divide 46 things into two equal parts:

$2\overline{)46\text{ things}} = 2\overline{)4\text{ tens and }6\text{ ones}} = ?$

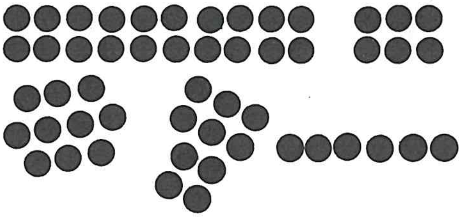
6. Divide 38 things into two equal parts: $2\overline{)38\text{ things}} = ?$

$2\overline{)38} = 2\overline{)3\text{ tens and }8\text{ ones}} = 2\overline{)2\text{ tens} + 18\text{ ones}}$

7. How many groups of 4 things are there in 48 things? $4\text{ things}\overline{)48\text{ things}} = 4\text{ things}\overline{)40\text{ things} + 8\text{ things}} = ?$

8. How many groups of 6 things are there in 72 things? $6\text{ things}\overline{)72\text{ things}}$ or $6\text{ things}\overline{)36\text{ things} + 36\text{ things}} = ?$

More Work in Finding the Size of Equal Parts



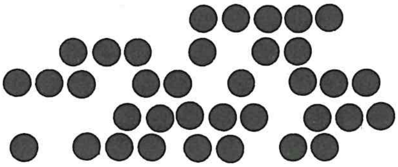
1. Put 26 counters into groups like these:

Can they be changed to look like those in the second group?

Now divide 26 into 2 equal parts:

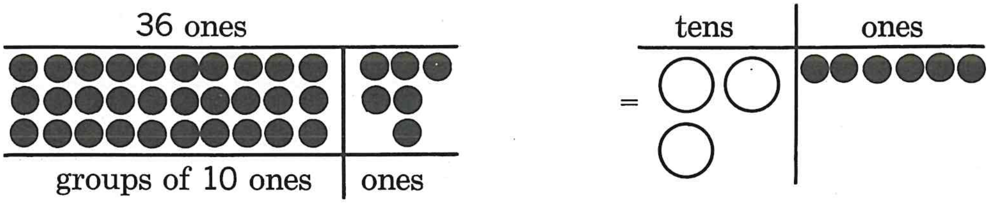
$2\overline{)2 \text{ tens and } 6 \text{ ones}} = ?$

How many tens in each part? How many ones?



2. Put 36 counters on your desk. By just looking at the number 36, how many tens are there? How many ones?

Is the following picture correct?



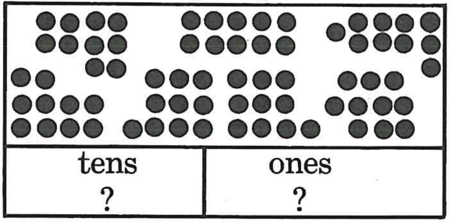
Divide your counters into 2 equal parts. What do you have to do with one of the tens?

3. Finish this problem:

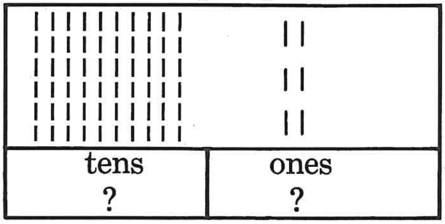
$2\overline{)3 \text{ tens and } 6 \text{ ones}} = 2\overline{)2 \text{ tens and } 16 \text{ ones}} = ?$

4. Tell how you can divide these into equal parts:

a. seven equal parts



b. six equal parts



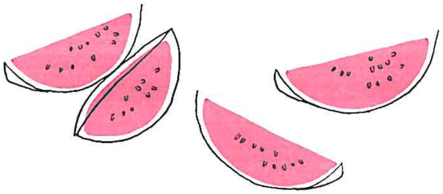
5. $3\overline{)3 \text{ tens and } 9 \text{ ones}} = ?$ $4\overline{)8 \text{ tens and } 4 \text{ ones}} = ?$

A Watermelon Feed

Pete tried hard to study his reading lesson, but he was having an awful time. You see, watermelons kept popping into his head! Fat, juicy watermelons!

Just last night Pete's mother said he could have everyone in his room come out to the farm for a watermelon feed. Tonight after school he is going out to the watermelon patch and take the biggest ripe watermelons down to the cave to cool them for the watermelon feed. But first of all, he needs to know how many watermelons to pick.

This is what he asked the children to help him figure:



"I am going to cut each watermelon into 4 large pieces. How many watermelons do I need for 36 children? This means that I must find out how many groups of 4 there are in 36."

John's work:

36 children
-4 = 1 watermelon
32
-4 = 1 watermelon
28
-4 = 1 watermelon
24

Kate's work:

4 = 1 watermelon
$+4$ = 1 watermelon
8
$+4$ = 1 watermelon
12

Finish the subtractions for John.

Finish the additions for Kate.

How many watermelons will Pete need?

Marjorie's work:

$$4 \text{ pieces}\overline{)36 \text{ pieces}} = ?$$

"I knew there were 4's in 36. I remembered it from my multiplication facts. You need 9 watermelons."

Checking Answers in Division

$2\overline{)46\text{ things}} = 2\overline{)4\text{ tens} + 6\text{ ones}} = ?$

46 things divided into 2 equal parts = 23 things in each part. Why? It means that 46 things = 23 things + 23 things, doesn't it?

When you prove that an answer is correct, it is called **checking**.

Can you check $2\overline{)46} = 23$ in all of these ways? Tell why.

Add:

$$\begin{array}{r} 23\text{ things} \\ \underline{+\,23}\text{ things} \end{array}$$

Multiply:

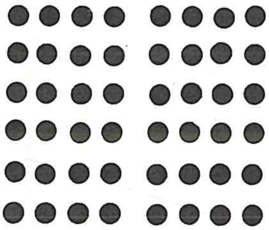
$$\begin{array}{r} 23\text{ things} \\ \underline{\times\,2} \end{array}$$

Subtract:

$$\begin{array}{r} 46\text{ things} \\ \underline{-\,23}\text{ things} \end{array}$$

1. When you divide $4\text{ things}\overline{)48\text{ things}} = ?$, you should find an answer of 12 groups of 4 things in 48 things. Check by multiplication:

$$\begin{array}{r} 4\text{ things} \\ \underline{\times\,12} \end{array} = \begin{array}{r} 4\text{ ones} \\ \underline{\times\,12} \\ 8\text{ ones} \\ \underline{40\text{ ones}} \\ ? \end{array}$$



You find 12 of the 4's by first taking 2 of them; 2 × 4 = 8 ones. Write 8 in ones place.

You know that the 1 in 12 is a ten, because it is in tens place. So 10 × 4 ones = 40 ones. Write 40 ones. Do you see that the 4 is in tens place? Do 40 ones = 4 tens?

$$\begin{array}{r} 4\text{ things} \\ \underline{\times\,12} \\ 48\text{ things} \end{array}$$

You could also change the 40 ones to 4 tens and write the 4 in tens place beside the 8 ones to get 48.

2. By what other two ways could you check that there are 12 groups of 4 things in 48 things? Do them.

3. What two ways could you use to check that 37 and 48 are the parts of 85?

4. How would you check that 32 is one of the two equal parts of 64?

Practice—Multiplication and Division Facts

Copy these facts. Write the answer in place of the question mark:

1. 8)72 = ? 8)16 = ? 8)48 = ? 9)27 = ?
2. 5)30 = ? 6)48 = ? 8)40 = ? 4)36 = ?
3. 4)24 = ? 9)36 = ? 2)18 = ? 8)24 = ?
4. 2)14 = ? 9)18 = ? 4)20 = ? 3)24 = ?
5. 3)15 = ? 1)9 = ? 7)21 = ? 5)15 = ?
6. 5)20 = ? 3)18 = ? 2)16 = ? 4)16 = ?
7. 6)18 = ? 7)14 = ? 3)12 = ? 2)12 = ?

8.	8	8	5	8	9	8	9	4	3
	× 9	× ?	× 6	× 5	× ?	× 3	× ?	× ?	× ?
	?	48	?	?	36	?	18	20	15
9.	1	4	2	2	4	4	6	9	8
	× 9	× ?	× ?	× 9	× ?	× 9	× 8	× ?	× 2
	?	24	14	?	8	?	?	27	?
10.	7	3	5	3	4	6	7	2	5
	× ?	× 8	× ?	× ?	× ?	× ?	× ?	× ?	× ?
	21	?	20	18	16	18	14	16	15

11. If Miss Brown wants to divide her 30 children into 5 equal groups, how many should she put in each group?

12. How many 6¢ ice cream cones can you buy for 42¢?

13. Six groups of 9 things each are how many things?

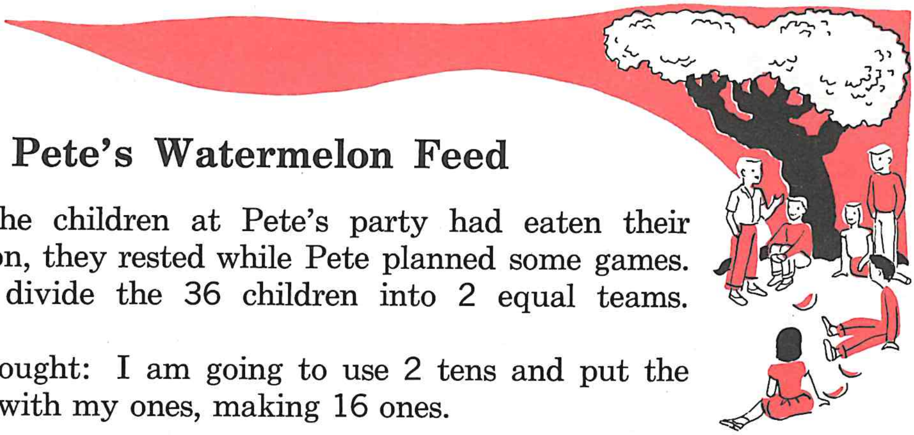
14. How many baseball teams of 9 players each can you get from 45 players?

15. At 7¢ each, what will 8 erasers cost?

16. Prove by addition that eight 7's = seven 8's.

17. Prove by subtraction that there are seven 9's in 63.

18. Count the pupils in your schoolroom. Can you divide them into 4 equal groups? How many are in each group? Are there any left over?



Fun at Pete's Watermelon Feed

After the children at Pete's party had eaten their watermelon, they rested while Pete planned some games. He must divide the 36 children into 2 equal teams. $2\overline{)36} = ?$

Pete thought: I am going to use 2 tens and put the other ten with my ones, making 16 ones.

$$\begin{array}{r} \text{? ten and ? ones} \\ 2\overline{)\text{2 tens and 16 ones}} \end{array} = ?$$

Pete could have thought this way, too:

$$\begin{array}{rl} \text{1 ten and 8 ones} & \\ 2\overline{)\text{3 tens and 6 ones}} & = 18 \\ \underline{\text{2 tens}} & \\ \text{1 ten and 6 ones} & = \text{16 ones} \\ & \underline{\text{16 ones}} \end{array}$$

I can use 2 tens out of 3 tens. 2 tens ÷ 2 = 1 ten. I will have 1 ten left. I write 1 ten in the answer.

The 1 ten left from the 3 tens and 6 ones = 16 ones. 16 ones ÷ 2 = 8 ones. Write 8 ones in the answer. There will be 18 children on each team.

Try this division by thinking the tens and ones:

$$\begin{array}{r} 18 \\ 2\overline{)36} \\ \underline{2} \\ 16 \\ \underline{16} \end{array}$$

You cannot divide 3 tens by 2 and have it come out even in tens.

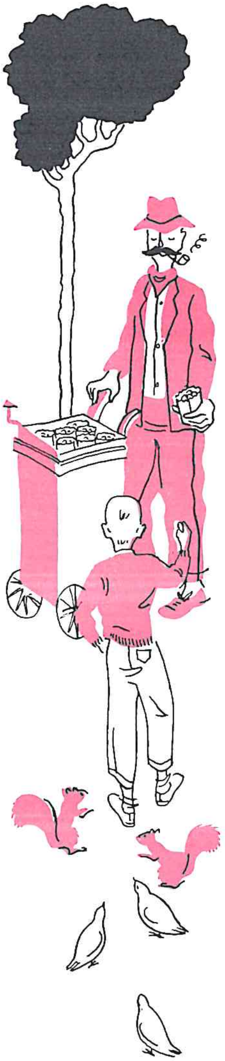
Think: 2 tens can be divided; there will be 1 ten left.

Do you see how this work is written? Why do you have 1 ten in the answer?

Explain the rest of the work.

1. Divide first by writing the place names. Then, second, divide by thinking them in the following:

$3\overline{)42}$ $\quad 2\overline{)38}$ $\quad 5\overline{)60}$ $\quad 2\overline{)54}$ $\quad 4\overline{)56}$ $\quad 3\overline{)75}$



Finding How Many Groups

You have seen how to use parts of numbers which you know (30 = 15 + 15) to help you to find a number of groups. Now see if you can use tens and ones:

1. How many 5¢ bags of peanuts could Pete buy for 65¢?

$$\begin{array}{l} \phantom{5\text{¢})65\text{¢} = 5)}10 + 3 = 13 \\ 5\text{¢}\overline{)65\text{¢}} = 5\overline{)50 + 15} \end{array}$$

is the old way of finding parts of a number to help divide.

Now try using tens and ones:

$$\begin{array}{l} \phantom{5\text{¢})65\text{¢} = 5)}?\qquad\qquad ?\qquad\qquad = ? \\ 5\text{¢}\overline{)65\text{¢}} = 5\overline{)6 \text{ tens and } 5 \text{ ones}} \end{array}$$

Do you know how many groups of 5 there are in 6 tens? (How many are there in 1 ten?) There would be 6 times as many as there are in 1 ten. Is this correct?

$$\begin{array}{l} 12 + 1 \qquad\qquad = 13 \\ 5\overline{)6 \text{ tens} + 5 \text{ ones}} \end{array}$$

Would this be easier?

$$5\overline{)5 \text{ tens} + 15 \text{ ones}} = ? \qquad \begin{array}{l} 5 \text{ tens} = 50 \text{ ones} \\ 5 \text{ ones}\overline{)50 \text{ ones}} = 10 \text{ or } 1 \text{ ten} \end{array}$$

Does this tell you that 5 tens ÷ 5 ones = 1 ten? So:

$$\begin{array}{l} \phantom{5\text{¢})65\text{¢} = 5 \text{ ones})}1 \text{ ten } + 3 \text{ ones} \quad = 13 \\ 5\text{¢}\overline{)65\text{¢}} = 5 \text{ ones}\overline{)5 \text{ tens} + 15 \text{ ones}} \end{array}$$

2. How many groups of 4 things are there in 56 things? Think the place values:

$$\begin{array}{r} 14 \\ 4\overline{)56} \\ \underline{4} \\ 16 \\ \underline{16} \end{array}$$

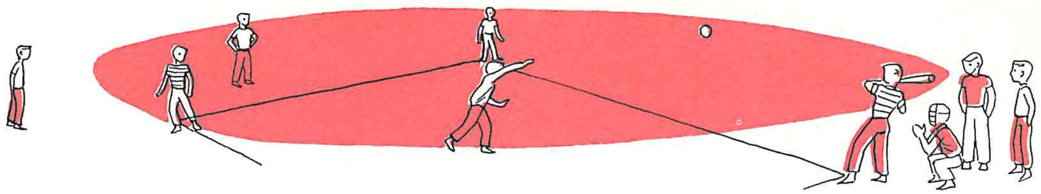
You use 4 tens on the first step. Why? 4 tens ÷ 4 ones = 10 or 1 ten. Write 1 ten in the answer.

One of the tens has not been used. Does the work show this?

There are 16 ones yet to be divided. Why? Explain the rest of the work.

3. Divide, thinking how many groups:

$$3\overline{)4 \text{ tens} + 2 \text{ ones}} \qquad 6\overline{)78} \qquad 3\overline{)45}$$

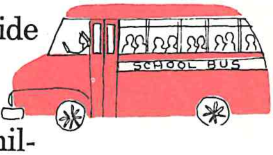


Reviewing Division

1. If you have 32 children and want to put them into 4 equal-sized groups for some games, tell why you are dividing the number 32 into equal parts.

$4\overline{)32\text{ children}} = \ ?$ children on each team.

2. There are 35 children in Miss Doe's class. If it takes 7 children for a softball team, tell why you are dividing 36 into groups to find how many teams can be made out of all the children. $7\text{ children}\overline{)35\text{ children}} = ?$ teams.



3. How many things are there in each part if you divide 84 things into four equal parts?

$4\overline{)84\text{ things}} = 4\overline{)8\text{ tens and }4\text{ ones}} = ?$ things.

4. Four of the school buses are going to take 96 children to the museum. If each bus carries the same number, how many children will there be in 1 bus?

$4\overline{)96\text{ children}} = 4\overline{)9\text{ tens and }6\text{ ones}} = 4\overline{)8\text{ tens} + 16\text{ ones}} = ?$

5. If 8 children can eat at each table in the lunchroom, how many tables are needed for 96 children?

$8\text{ children}\overline{)96\text{ children}} = ?$ tables.

Can you write the 96 as 9 tens and 6 ones? Can you see how many groups of 8 children each there are in 9 tens of the children? Is it easier to use 8 tens and 16 ones?

6. How many groups of 6 children each in 96 children?

$6\text{ children}\overline{)96\text{ children}} = 6\text{ ones}\overline{)36\text{ ones} + 36\text{ ones} + 24\text{ ones}} = ?$

7. Divide to find the size of each part:

$4\overline{)88\text{ things}}$ $3\overline{)69\text{ things}}$ $5\overline{)75¢}$ $6\overline{)72¢}$

8. What parts of 92 will you use so that you can divide it easily into four equal parts?

9. Divide to find how many groups:

$3\text{ things}\overline{)63\text{ things}}$ $2\text{ things}\overline{)82\text{ things}}$ $2¢\overline{)54¢}$

Practice in Division

1. How would you write 54 in tens and ones so that you could divide it into 3 equal parts?

$3\overline{)54} = 3\overline{)5 \text{ tens and } 4 \text{ ones}} = 3\overline{)\quad ? \quad \text{tens and} \quad ? \quad \text{ones}}$

Check the answer.

2. Divide 36 children into 3 groups for relay games. Check the answer.

3. If you want to divide 48 into 3 equal parts, how many tens will you use as tens? How many tens will be left? How many ones will you still have to divide into three equal parts?

4. How would you write 96 in tens and ones so you can divide the number into 2 equal parts most easily?

5. Divide by writing the tens and ones:

$3\overline{)69}$ $3\overline{)96}$ $4\overline{)88}$ $2\overline{)86}$ $3\overline{)99}$ $2\overline{)64}$ $5\overline{)55}$

$3\overline{)72}$ $4\overline{)92}$ $5\overline{)95}$ $6\overline{)96}$ $7\overline{)84}$ $4\overline{)76}$ $6\overline{)90}$

6. Divide $2\overline{)78}$ by *thinking* the tens and ones.

$$\begin{array}{r} 3 \\ 2\overline{)78} \\ \underline{6} \\ 1 \end{array}$$

Think: 7 tens ÷ 2 does not come out even.
I will use 6 tens. 6 tens ÷ 2 = ? tens.
Finish the problem.

a. $2\overline{)62}$ $2\overline{)82}$ $3\overline{)99}$ $3\overline{)63}$ $4\overline{)80}$ $4\overline{)48}$

Divide and check by multiplication:

b. $3\overline{)45}$ $5\overline{)85}$ $6\overline{)78}$ $7\overline{)98}$ $8\overline{)96}$ $4\overline{)72}$

7. Do you remember these? If you don't, find parts that you can use:

$7\overline{)49}$ $9\overline{)72}$ $8\overline{)64}$ $9\overline{)63}$ $6\overline{)54}$ $8\overline{)48}$ $7\overline{)63}$

$8\overline{)56}$ $7\overline{)56}$ $9\overline{)45}$ $8\overline{)40}$ $8\overline{)72}$ $7\overline{)28}$ $5\overline{)45}$

8. There will be 72 children eating at the first lunch period. If 6 children can be placed at each table, how many tables will be needed?

$$6\text{ children}\overline{)72\text{ children}} = ?\text{ tables.}$$

9. If the pies are cut into 6 pieces, how many pies will be needed to serve 1 piece to each of 84 children?

$$6\text{ pieces}\overline{)84\text{ pieces}} = ?\text{ pies.}$$

10. How many 3¢ stamps can you buy for 75¢? $3\text{¢}\overline{)75\text{¢}}$

$$3\text{¢}\overline{)75\text{¢}} = \begin{array}{r} 2 \\ 3\overline{)75} \\ \underline{6} \end{array}$$

There are 10 (1 ten) groups in 30 (3 tens).

Then there are 20 (2 tens) groups in 60 (6 tens).

Finish the problem.

11. How many nickels in change can you get at the bank for 95 pennies?

12. Which is more, the number of groups of 5 things in 45 things or the number of 7's in 56? How much more?

13. Find how many 5's there are in 60 by using $5\overline{)10 + 20 + 30}$.

14. Divide: $5\text{¢}\overline{)95\text{¢}}$ $\quad 7\text{¢}\overline{)98\text{¢}}$ $\quad 3\text{¢}\overline{)51\text{¢}}$ $\quad 6\text{ apples}\overline{)78\text{ apples}}$

15. How many groups of 4 chairs each are there in a total of 76 chairs?

16. It takes 4 sheets of large paper to make the kind of notebooks that Miss Brown wants each child to have for his science work. If a bundle of this size paper contains 8 dozen sheets, how many notebooks can be made from 1 bundle?

17. When you use numbers to separate a group of things into equal groups or parts, what two ways can you use to find how many equal groups there are?

18. Show how you would find the number of groups of 7 things each there are in 84 things. (Use 84 as 70 + 14, and then as 8 tens and 4 ones.)

Diane Makes Brownies

Diane had such a good time at Pete's watermelon feed that she decided to give a party for the children in her class. She is going to make brownies.

Here is the recipe that Diane is going to use for her brownies.

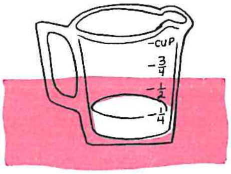
$\frac{1}{2}$ cup shortening
2 one-ounce squares of unsweetened chocolate
$\frac{3}{4}$ cup flour
$\frac{1}{2}$ teaspoon baking powder
$\frac{1}{2}$ teaspoon salt
2 eggs
1 cup sugar
1 teaspoon vanilla
1 cup nuts, cut in pieces

Melt shortening and chocolate together over hot water. Cool. Sift flour with baking powder and salt. Beat eggs until light; add sugar; then add chocolate mixture and blend. Add flour, vanilla, and nuts. Mix well. Pour batter into an 8-inch square pan that has been lined with waxed paper. Bake in moderate oven (350°) for 30 to 35 minutes. Cool and cut into squares. Makes 16 brownies.

1. Diane needs to double the amount of everything in the recipe so she will have enough brownies for everyone in the class. Draw a picture to show the amount of each thing that Diane must use in doubling the recipe.

2. Double the amounts shown below (draw the pictures):

a. $\frac{3}{4}$ cup of milk **b.** $\frac{1}{4}$ tsp. salt **c.** $\frac{1}{2}$ lb. butter



3. There are 4 equal parts in this measuring cup. What part of the cup is filled with sugar? How many more of these equal parts must be added to fill the cup?

Diane Makes Raspberry Cooler

Diane said to herself, "I just know that everyone will be very thirsty these hot September days. I will make a cold drink for each of the 30 children."

This is the recipe that she used.

Raspberry Cooler

- $\frac{1}{2}$ package raspberry-flavored powder
- $\frac{1}{2}$ package grape-flavored powder
- $\frac{1}{4}$ cup sugar
- 4 cups water
- $\frac{1}{2}$ cup orange juice
- $\frac{1}{2}$ cup lemon juice
- $\frac{1}{2}$ cup crushed pineapple

Dissolve powders and sugar in water; add fruit juices and pineapple; chill; serve in frosted glasses. Recipe makes $2\frac{1}{2}$ quarts of drink.

Diane wanted to be sure to have 60 glasses, so that everyone could have a second glass.

Diane knew that $2\frac{1}{2}$ meant that you had 2 wholes and $\frac{1}{2}$ of another whole, so $2\frac{1}{2}$ quarts was the same as 2 quarts and 1 pint. But Diane does not know how many cups there are in this amount.

Diane found this table of liquid measurements in her mother's cookbook. You can take a measuring cup, pint jar, and quart jar to check the amounts.

LIQUID MEASURES

2 cups = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

If Diane's glasses hold as much as 1 cup each:

1. How many glasses in 1 quart? in 2 quarts?
2. Why is $\frac{1}{2}$ quart the same as 1 pint?
3. How many glasses in 2 quarts and 1 pint?
4. You know how many glasses of drink the recipe uses. How much must Diane use of everything in the recipe?

Liquid Measures

Diane Makes Raspberry Ice Cream

Diane is going to make raspberry ice cream to go with the brownies she made. She needs to buy sugar and raspberries. She must know these dry measures.

Do you see that some of the dry measures are the same as the liquid measures on the last page? (You must remember that the dry measures are a little larger than the liquid measures. Why?)

DRY MEASURES
2 pints = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

This is the recipe that Diane is going to use:

Raspberry Ice Cream

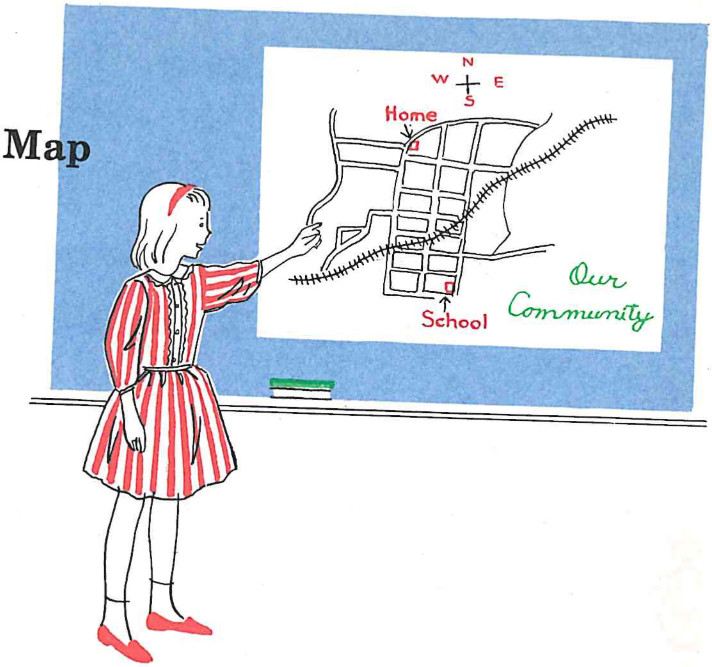
1 envelope unflavored gelatine
$\frac{1}{4}$ cup cold water
2 well-beaten egg yolks
$\frac{3}{4}$ cup sugar
$\frac{1}{4}$ teaspoon salt
$1\frac{1}{2}$ teaspoons vanilla
2 cups crushed raspberries
2 cups top milk or light cream
2 egg whites
$\frac{1}{4}$ cup sugar

Soften gelatine in cold water; dissolve over hot water. Combine egg yolks, sugar, salt, vanilla, berries, and top milk. Add dissolved gelatin. Mix thoroughly and freeze in a refrigerator tray. Beat egg whites, gradually adding the $\frac{1}{4}$ cup sugar, and continue beating until mixture is stiff and sugar is dissolved.

Add this to the frozen mixture and beat until fluffy-smooth. Freeze the mixture again. This amount serves 10.

1. If this recipe serves 10 people, Diane must use ? times this amount of everything in the recipe to serve the 30 children. Draw pictures showing the amount of everything Diane will use in making the ice cream.

Diane Draws a Map

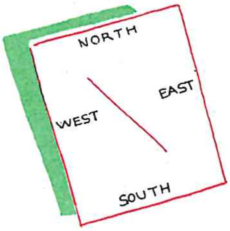


Diane is giving her party Saturday afternoon. Some of the children do not know where she lives. This is the map she has drawn for the class.

Everyone knows where the school is. Would anyone living near the school be able to find Diane's house by using this map?

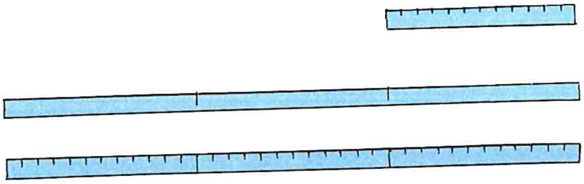
How many blocks does Diane live from the school? What else do you think Diane should have put in her map? Do you think she should have put in the names of the streets?

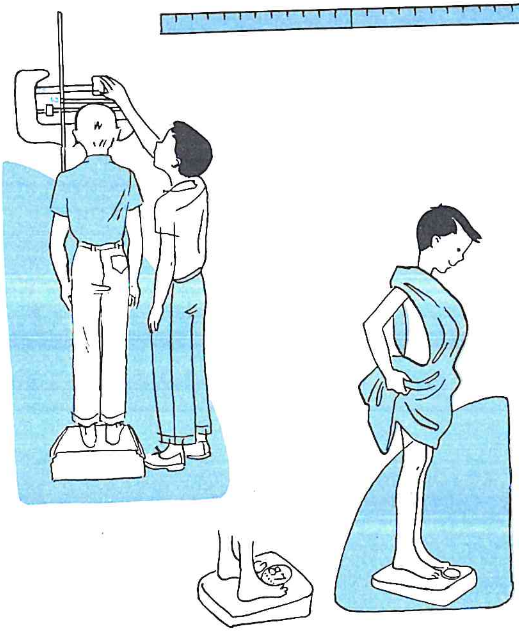
1. Diane lives ? blocks west of the school.
2. She lives ? blocks north of the school.
3. When you get in the block where Diane's house is, what will you have to know to tell which house is hers?
4. What could Diane do to be sure that you find the right house easily?
5. Draw a map showing your school and your home.



Start by making a chart like this one. If the streets or roads in your community do not run north and south, draw the lines to show the direction they do run. Perhaps they run northeast to southwest. If so, draw the lines in that direction.

Finding How Tall We Are and How Much We Weigh



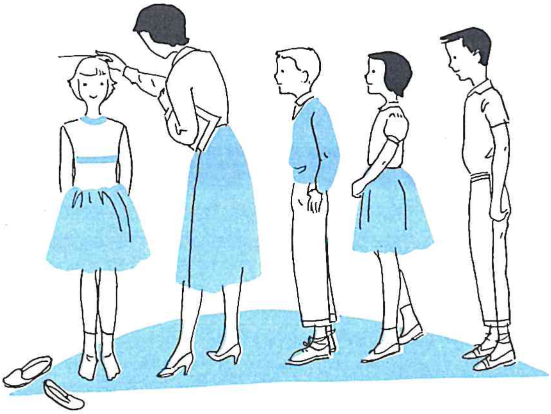


When Pete came to school the first day, his teacher said, "Pete, you have grown a foot!" Pete wondered if he really had grown a foot. Today he would find out.

Pete and all the children went with the teacher to the nurse's room. Each one was weighed and measured at the same time. Look at the scales on the left. Tell how much Pete weighs. How tall is he?

Tom is getting weighed on another kind of scales. How much less does he weigh than Pete?

Pete's friend, Jimmy, goes to a small school in the country that does not have a scale. To see how tall the children are, they must stand against the wall so their teacher can put a dot to show where the top of each head is. When Jimmy uses a yardstick to measure his own height, he finds that it is one yardstick and 16 inches left over. How tall is Jimmy in inches?



Weights and Heights

Making a Height Chart

The children in the fifth grade want to compare their heights. They are going to make a chart that will show how tall each child is. Bob Anderson's name was the first one. He is the tallest boy of all. He is 62 inches tall.

David said, "Who ever heard anyone say that he was 62 inches tall? People always say that they are so many feet and so many inches tall."

Pete said, "There are 12 inches in a foot, but how many 12's are there in 62 inches?"

Mike said, "I know that I should divide 62 by 12. I don't know how to do it the division way, but I can use subtraction."

This is Mike's work:

62 in.
− 12 in.—1 ft.
50 in.
− 12 in.—1 ft.
38 in.
− 12 in.—1 ft.
and so on.

Then he said, "I have subtracted 12 in. enough times to find that there are 5 ft. and 2 in. in 62 in." Was he right?

The teacher said, "We had better check this."

Sam's check:

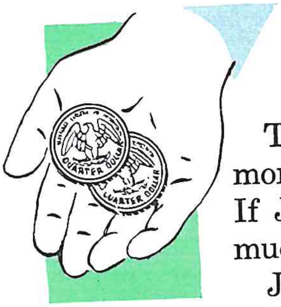
12 in. = 1 ten and 2 ones. You must multiply this by 5 and then add the 2 in.

1 ten and 2 ones
× 5
5 tens and 10 ones = 60 in.
Then 60 in. + 2 in. = 62 in.

Finish this chart and check:

Name	Height—inches	Height—feet and inches
Bob Anderson	49 62 62	5 ft. 2 in.
Tony Barnes	60	
Betty Clinton	60 57	
Bill Dow	57 52 52	
Margaret Dunn	49	
Alfred Evans	50 50	

Changing Inches to Feet and Inches



Money Values

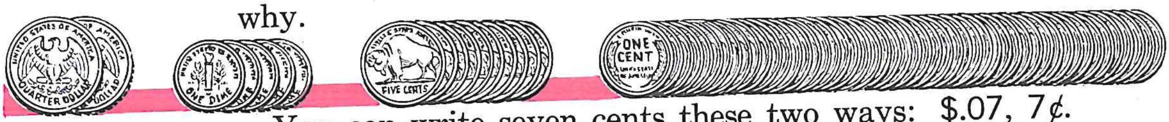
Today, when Jimmy was weighed at school, he weighed more than anyone in the class. He weighs 76½ pounds. If Jimmy got a dollar for every pound he weighs, how much money would he have?

Jimmy said later, "All I have is a half-dollar."

Was he right?

Linda asked Jimmy if he would trade his two quarters for 50¢. Then she could give lunch money to her little brother. If Jimmy trades, will he have as much money as he had before?

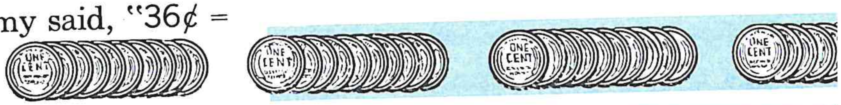
Does a half-dollar equal each of these amounts? Tell why.



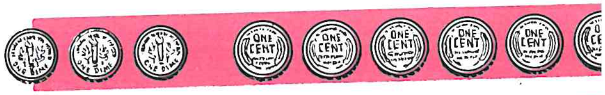
You can write seven cents these two ways: $.07, 7¢. This means there are no tens, but there are 7 ones (no dimes, but 7 cents). If you use the dollar sign ($) and the cents point (.) and you have less than 10¢, you always write a zero to show there are no tens: $.09 = 9¢.

Miss Brown asked the children to tell some different ways that they might use to show what coins make 36¢.

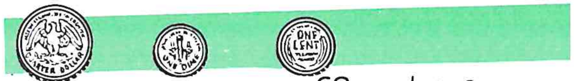
Jimmy said, "36¢ =



Henry said, "36¢ =



Shirley said, "36¢ =



1. Write these amounts two different ways: 68 cents; a half-dollar and five cents; three quarters and nine cents; four cents; three dimes and twenty-three cents; five nickels.

May We Have a Bank?

"It is such fun to work with money! May we have a bank in our room?" Jimmy asked Miss Brown.

"Maybe we can. We will see," Miss Brown said. "If we had a bank in our room and you were the banker, what would you do if I came to you with a quarter and wanted to put 16¢ in the bank?"

Billy said, "It would be like giving you change. I would keep your quarter and give you the *difference* between 16¢ and 25¢. This is the way I would count it: 16¢, and a penny is 17¢; another penny is 18¢; another penny is 19¢; another penny is 20¢; a nickel more is 25¢."

"Very good, Billy," Miss Brown said. "What would you do if I came in with a half-dollar and wanted to put only 37¢ in the bank?"

Billy said, "You are putting 37¢ in the bank, so I would say 37¢, and a penny makes 38¢; another penny makes 39¢; another penny makes 40¢; and a dime makes 50¢."

1. Write the names of the coins you use in giving change in each of the following problems:

a. Jane has 50¢. She wants to put 18¢ in the bank.

b. Patty has 3 quarters. She is going to put 63¢ in the bank.

c. Frank brought $.50 to school. He is going to put $.21 in the bank.

2. Pete gives you a quarter. He wants to put 15¢ in the bank. He will get one coin for change. What is that coin?

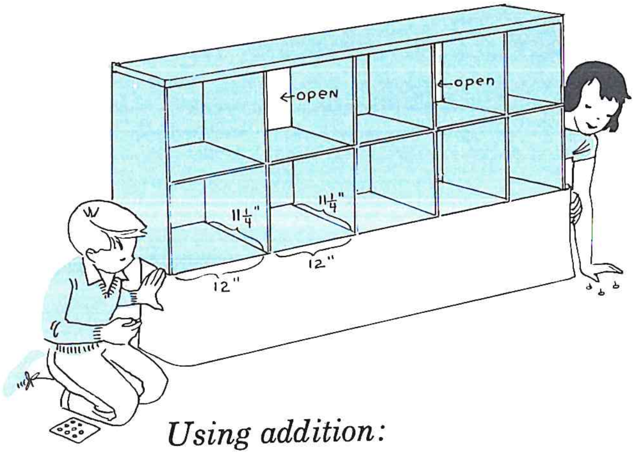
3. Marie is going to put 35¢ in the bank. She gives you 50¢. If you were giving her change, what two coins would you give her?

4. Alan brings 2 quarters, a dime, 16 pennies, and a nickel. He wants to put it all in the bank. How much will he put in the bank?

Counting Change

Our Room Bank

Miss Brown said the children had done so well they could build a bank in their room. The first thing they did was to get 13 apple boxes. They nailed these together. They need a board to go across the top to hold the top boxes in place and to make the bank look better. How long must this board be?



They found a board that is 6 feet long. How much must they cut off?

Miss Brown wanted to know how long the piece of wrapping paper should be to go around the bottom of the crates. Find how long it should be.

Using addition:

Side 11$\frac{1}{4}$ inches
Front 12
12
12
12
12
Side 11$\frac{1}{4}$
? inches

Add $\frac{1}{4}$ and $\frac{1}{4}$ inches first. How much are $\frac{1}{4}$ and $\frac{1}{4}$ inches?

Now add the whole numbers.

What is the total number of inches?

Now you should change the inches to feet and inches. You don't know how many 12's there are in this many inches, so you subtract 12's to find the whole number of feet. You then see how many inches are left over.

How many feet and how many inches of paper do you need?

Practice with Feet and Inches

There is another way the children could have figured how much paper they needed. They could have used multiplication and addition.

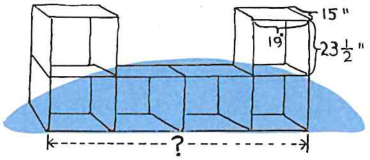
Sides 11$\frac{1}{4}$ inches
$\underline{\times 2}$
? inches

What are two $\frac{1}{4}$ inches?
Next multiply 2 × 11.

Front 12 inches
$\underline{\times 5}$
? inches

Now you must add the sides and the front to see how long it is altogether.

Sides ? inches
Front $\underline{+\ ?}$ inches
? inches Change the inches to feet and inches.

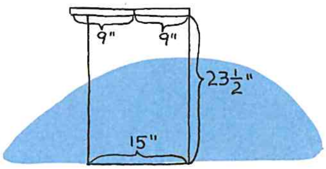


The children in Room 12 are also making a bank. They are making it out of lettuce crates.

They used 6 lettuce crates. They are putting a board ($\frac{1}{2}$-inch thick) over the top of the 4 crates. How many inches long must this board be? (Find the answer by both multiplying and adding.)

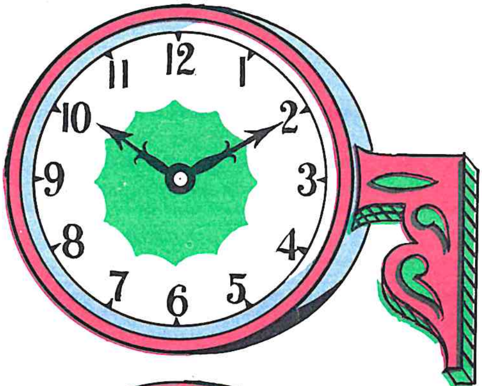
The only boards the children could find had the following lengths: 3 feet; 3 feet 7 inches; 4 feet 2 inches; 2$\frac{1}{2}$ feet.

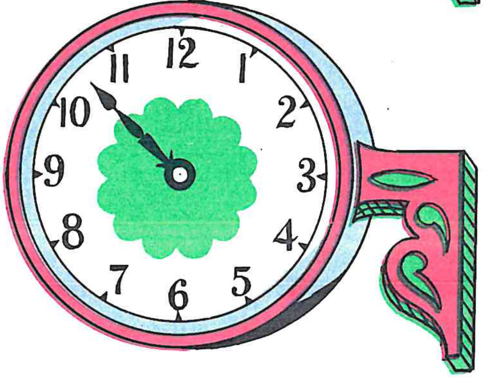
If they use the 3-foot board and the one that is 3 feet 7 inches long, how much must be cut off?



These boards are all 9 inches wide. If they use 2 boards of this width to cover the tops of the crates, how much too wide will the cover be?

Find how much paper will be needed to go around the 4 bottom crates. Find your answer in feet and inches.





Bank Time

The children decided to open the bank every morning at 10:10 A.M. This means 10 minutes after 10 in the morning.

A.M. means the hours from midnight to noon. P.M. means the hours from noon to midnight.

It takes about 20 minutes for the children to bank. Draw a clock like this and put the minute hand at the time the children finish banking.

The bankers try to finish counting the money by 10:45 so they will have time to do their arithmetic. See how much time they have to do this work.

One day the children could not start banking until 10:20. It took them 30 minutes to bank because many of the children took money out of the bank for the school bazaar. It took the bankers 35 minutes to count the money and check the deposit slips and withdrawal slips to be sure they were right. What time did the bankers finish with all their work?

First, you add the minutes they worked: 30 + 35 = 65

Then, you add this to the time they started:

10:20 A.M.
+ 65 min.
10:85
or
11:25 A.M.

In the addition, you may hold an hour from the 85 minutes. Why? You have 25 in minutes place. Add the hour held to the hours you have. The answer is 11 hours and 25 minutes.

1. Add: **a.** 1 hour and 16 min.
2 hours and 50 min.
? hours and ? min.

b. 2 hr. 36 min.
4 hr. 48 min.

How Much Time?

The children took all of one morning to get started on making their bank. They first spent 50 minutes in planning their work. Then they worked until the lunch period. How long a time did they work if the school morning is 2 hours and 20 minutes long?

$$\begin{array}{ll} 2 \text{ hours} & 20 \text{ minutes} \\ - & 50 \text{ minutes} \\ \hline \\ 1 \text{ hour} & 80 \text{ minutes} \\ - & 50 \text{ minutes} \\ \hline 1 \text{ hour} & 30 \text{ minutes} \end{array}$$

You cannot subtract 50 minutes from 20 minutes. You can change one of the hours to get more minutes in order to subtract.
2 hr. 20 min. = 1 hr. 80 min.

One hour and 30 minutes is $1\frac{1}{2}$ hours. Why?

> Remember: When you do not have enough minutes to subtract, you use one of the hours for additional minutes.
>
> *Every hour equals 60 minutes.*

Try doing another one:

$$\begin{array}{r} 2 \text{ hours } 25 \text{ minutes} \\ -\ 1 \text{ hour } \ 36 \text{ minutes} \\ \hline \end{array} = \begin{array}{r} 1 \text{ hour } \ ? \text{ minutes} \\ -\ 1 \text{ hour } 36 \text{ minutes} \\ \hline \end{array}$$

Why did you have to change an hour? How many minutes do you now have? Subtract the minutes:

? − 36 minutes = ?

Now subtract the hours. There are no hours left. Why?

Study this exercise:

$$\begin{array}{rr} 4 \text{ hours} & \\ -\ 1 \text{ hour} & 15 \text{ minutes} \\ \hline \end{array} = \begin{array}{rr} 3 \text{ hours} & 60 \text{ minutes} \\ -\ 1 \text{ hour} & 15 \text{ minutes} \\ \hline ? & ? \end{array}$$

You cannot take 15 minutes from no minutes. You use 1 hour. This gives you 60 minutes. Finish the work.

Subtract:

$$\begin{array}{r} 7 \text{ hours } 40 \text{ minutes} \\ -\ 3 \text{ hours } 10 \text{ minutes} \\ \hline \end{array} \qquad \begin{array}{r} 3 \text{ hours } 15 \text{ minutes} \\ -\ 2 \text{ hours } 20 \text{ minutes} \\ \hline \end{array} \qquad \begin{array}{r} 10{:}20 \\ -\ 4{:}40 \\ \hline \end{array}$$

How Well Do You Remember?

1. Count the children in your room today. If you were going to make lemonade so that each child could have 1 cup, how much should you make? Give the amount in pints (1 pt. = 2 c.); in quarts; in gallons and parts of gallons.

2. There are 6 persons in Jane's family. If everyone drinks a glass of milk for supper, how many quarts will be needed? Each glass holds 1 cup.

3. Bobby's mother sent him to the store for a gallon of cider. He could buy the cider only in quart bottles. How many quarts must he buy? What part of a gallon is 1 quart? What part is 3 quarts?

4. How many pecks are there in a bushel? Did you ever buy a peck of anything? If so, what was it?

5.

Add:	Subtract:	Multiply:
4 feet 2 inches	5 ft. 8 in.	1 qt. 1 pt.
1 foot 8 inches	1 ft. 10 in.	3

6. Add:

67¢	18¢	37¢	$.19	26¢	19¢	34¢	$.72	$.90
18¢	26¢	19¢	.37	15¢	42¢	17¢	$.18	.16

7. Subtract:

$.76	31¢	50¢	$.63	$.48	$.57	48¢	59¢	$.70
.18	27¢	34¢	.19	.39	.19	15¢	13¢	.35

8. Multiply by writing out the tens and ones:

$$\begin{array}{r}18\text{¢}\\ \underline{5}\end{array} = \begin{array}{r}\text{1 ten and 8 ones}\\ \underline{\times 5}\end{array}$$

16¢	12¢	13¢	15¢	$.19	$.26	$.23	10¢
6	7	5	6	4	3	4	6

9. Divide:

2¢)40¢   3¢)89¢   4¢)88¢   5¢)75¢   5¢)80¢   6 apples)72 apples

10. Add:	**11.** Subtract:
3 hr. 25 min.	5 hr. 45 min.
2 hr. 46 min.	2 hr. 30 min.

Unit Test

1. Add:

23	20	16	76	19	36	15	26	16
17	14	46	15	28	27	58	35	28

2. Subtract:

71	46	75	92	46	78	50	84	50
46	18	39	75	18	19	28	27	29

3. Multiply:

24	46	$.34	$.18	$.17	$.26	36	15	18
× 4	× 2	× 2	× 3	× 4	× 2	× 2	× 3	× 4

4. Divide:

$5\overline{)75}$ $9\overline{)63}$ $3\overline{)72}$ $6\overline{)54}$ $3\overline{)51}$ $6\overline{)42}$ $5\overline{)95}$ $3\overline{)90}$ $4\overline{)76}$

5. Story problems:

a. Janet has 3 dozen cookies. How many cookies will each of her 6 friends get if the cookies are divided equally?

First, find how many cookies in three dozen. Then, find how many cookies each of the 6 friends will get.

b. Tommy has 54 trading cards. Find how many he will give to each of his 9 friends if he gives each one an equal number.

c. Mike has 2 dozen marbles. How many does he have left if he loses 8 of them?

6. Do these:

a. 6 hours 10 minutes
− 2 hours 25 minutes

b. 2 hours 35 minutes
+ 2 hours 45 minutes

c. Change 68 in. to feet and inches.

d. 4 feet 8 inches
− 2 feet 9 inches

e. 3 feet 10 inches
+ 2 feet 8 inches

f. 1 foot 3 inches
+ 1 foot 4 inches

7. Fill the blanks:

a. ? cups = 1 pint
b. 1 foot = ? inches
c. ? inches = 1 yard
d. 1 quart = ? cups
e. ? pints = 1 quart
f. 2 quarts = ? pints

UNIT 2

Taking Care of My Money

Do you earn any money? How do you earn it? You will be surprised at all the ways the boys and girls in this unit make money. The girls had a hard time thinking how they could earn money, but they found some ways.

What do you do with the money you have? Do you save any of it? Why do you save your money?

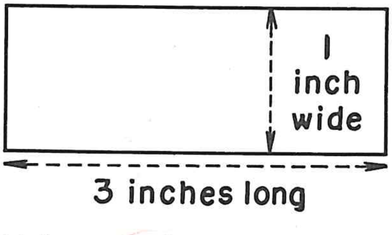
Now, of course the boys and girls can't work all the time. Some of the time they play. They have clubs that are a lot of fun. The girls have a Shadow Club and the boys have an All-American Club. They have club dues. How do you suppose they use arithmetic?

Just stop and think of how you earn and spend your money. Tell about some times when you added in taking care of your money. Can you think of a time when you subtracted money?

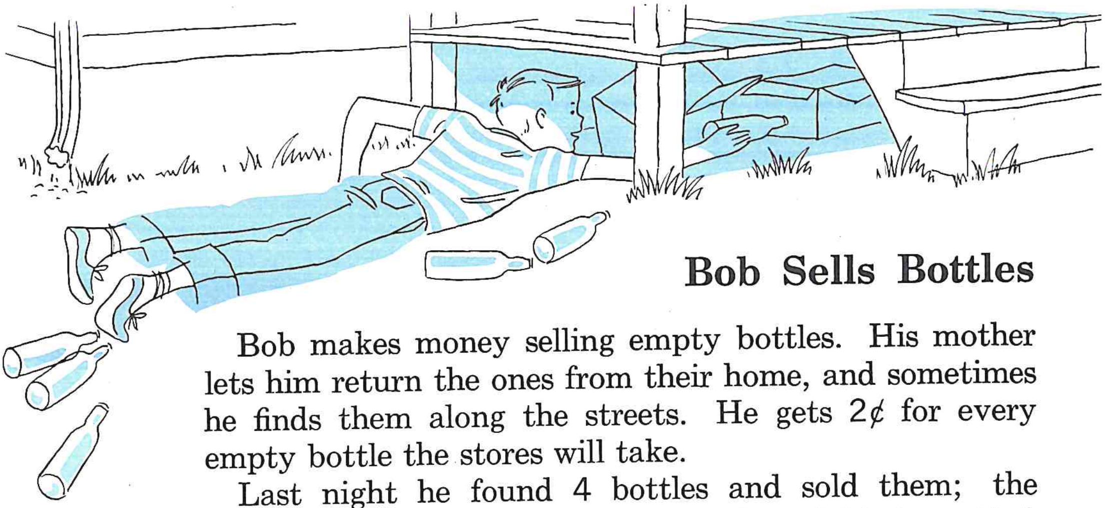
When would you need to use multiplication while figuring how much you had spent and how much you had left?

When would it be wise to use division before spending some money?

Be sure you have your counters of tens and ones. If you don't, make them right now. You will be using them all the time. This may be one way you can help your teacher. If she has not had time, you could cut pieces of tagboard for her about this size. If you have any new boys and girls who have just come into your class, maybe she will let you make some for them.



You do much work at home for which you don't receive money. Can you think of many things your parents do for you for which they don't receive money?



Bob Sells Bottles

Bob makes money selling empty bottles. His mother lets him return the ones from their home, and sometimes he finds them along the streets. He gets 2¢ for every empty bottle the stores will take.

Last night he found 4 bottles and sold them; the night before he sold 3 bottles, and tonight he sold 2 bottles. This is what he got for them:

8¢
6¢
4¢
18¢ = 1 dime and 8 pennies

●● ●●●●

Bob said, "8¢ and 2¢ are 10¢; 10¢ and 4¢ = 14¢. 14¢ and 4¢ = 18¢."

Bob found 3 different kinds of bottles, and he knows that the Bear Market will take all 3 kinds. He adds the amounts he will receive before he goes into the store, so he will be sure to get the right amount.

He could count:

8¢ 8¢
4¢ 9¢, 10¢, 11¢, 12¢
4¢ 13¢, 14¢, 15¢, 16¢
16¢

He could add by this method:

8¢ 8 + 4 = 12; 12 + 4 = 16
4¢
4¢
16¢

Bob doesn't count because it takes too long. He builds tens in addition when he doesn't know his addition facts. This is the way he *builds tens:*

6¢
8¢
4¢
18¢

●●●● ●●●●

Bob uses the 8 as 4 and 4. This helps him find a 10. 6¢ and 4¢ = 10¢; 10¢ and 4¢ = 14¢; 14¢ and 4¢ = 18¢.

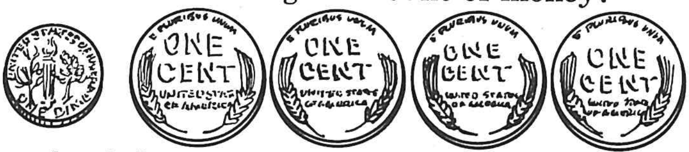
Bob Keeps a Record of His Money

Bob sold empty bottles 3 nights after school. Here are the amounts he received for the three nights:

$$\begin{array}{r} \left.\begin{array}{r}4\text{¢}\\ 8\text{¢}\end{array}\right> 12\text{¢} \\ \underline{2\text{¢}} \\ 14\text{¢}\end{array}$$

Bob knows every one of his teens addition facts, so he knows that 4 and 8 = 12. He may know that 12 and 2 = 14, or he may think: 1 ten + 2 ones + 2 ones = 1 ten + 4 ones = 14.

Do these coins show the right amount of money?



1. Add each of these exercises by *building tens* to find the amount Bob made on other evenings:

a.	b.	c.	d.	e.	f.	g.	h.
8¢	6¢	4¢	6¢	8¢	6¢	6¢	4¢
8¢	8¢	8¢	6¢	5¢	4¢	6¢	4¢
2¢	3¢	6¢	4¢	4¢	8¢	2¢	8¢

Bob is going to total the amounts he makes on different nights. He knows that he must go from the teens (like seven*teen*, eigh*teen*, nine*teen*) into the 20's.

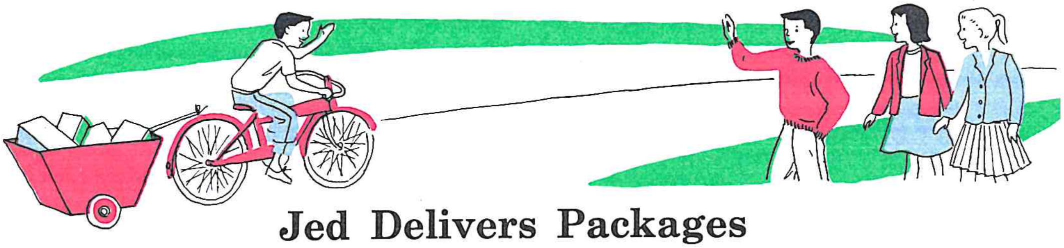
$$\begin{array}{r} \left.\begin{array}{r}9\text{¢}\\ 8\text{¢}\end{array}\right> 17\text{¢} \\ \underline{9\text{¢}} \\ 26\text{¢}\end{array}$$

He knows that 9¢ and 8¢ = 17¢. He uses the parts of 3 and 6 of the next 9 to help him build a 20 or 2 tens. 17¢ + 3¢ = 20¢; 20¢ + 6¢ = 26¢.

2. Draw circles beside the last number in each of these exercises to show how you used parts of this number to build a 20:

6¢	9¢	7¢	6¢	9¢	7¢	9	8
8¢	7¢	6¢	5¢	9¢	8¢	6	5
8¢	6¢	7¢	9¢	7¢	9¢	9	8

Building 20 or 2 Tens in Addition



Jed Delivers Packages

Jed makes money delivering packages for the Brown Grocery. See if he added today's earnings correctly.

	dimes	pennies
28¢	●●	●●●●●●●●
20¢	●●	
35¢	●●●	●●●●●
15¢	●	●●●●●
=	8	18

=

dimes	pennies
2	8
2	0
3	5
1	5
8 dimes	18 pennies
	or
9 dimes	8 cents

Why could he have done the work this way, too?

$$\begin{array}{r} 28 \\ 20 \\ 35 \\ +\ 15 \\ \hline \end{array} = \begin{array}{l} 2 \text{ tens} + 8 \text{ ones} \\ 2 \text{ tens} + 0 \text{ ones} \\ 3 \text{ tens} + 5 \text{ ones} \\ 1 \text{ ten} + 5 \text{ ones} \\ \hline 8 \text{ tens} + 18 \text{ ones} \end{array} = 9 \text{ tens} + 8 \text{ ones} = 98$$

The answer is 98¢, or $.98 (always label your answer).

If you change 10 ones to a ten and add it to the other tens, it may be called **holding** or **carrying** a ten.

Add by thinking tens and ones:

$$\begin{array}{r} 25 \\ 35 \\ 16 \\ \hline 76 \end{array}$$

5 and 5 are 10; 10 and 6 = 16. 16 is 1 ten and 6 ones. Write the 6 in ones place in the answer, and hold the 1 ten. 2 tens + 3 tens = 5 tens; 5 tens + 1 ten + 1 ten (held) = 7 tens.

1. Add by thinking tens and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
26	34	17	38	19	27	36	31
14	36	28	16	32	18	15	18
12	15	15	15	16	13	27	18

Holding Tens in Addition

Jed Makes More Money

Jed does such a good job delivering packages that Mr. Brown said he could use him 3 nights a week after school and on Saturday. Jed is very glad to be making more money, but he knows he must add longer numbers to keep count of the money he makes. Jed is adding the number of packages he delivered each of the 3 evenings and on Saturday this week.

9 >17
18 — danger
17
+ 5

Jed knows that 9 and 8 are 17; he uses parts of 7 (3 and 4) to get to 20. He must be very careful to remember that the sum of 9 and 8 is 17. If he can remember it, he can think: 17 and 3 (part of 7) are 20, and 4 more are 24. Now he is ready for the next number, which is a 5. 24 and 5 are 29. Why? Write the 9 in ones place in the answer, and hold the 2 tens. Now add the tens: 1 + 1 + 2 (held) = 4 tens. Write 4 in tens place in the answer.

Jed knew the danger spot was in remembering the sum of the first numbers. Then he could get to 20 by using parts of the next number. Try another one with Jed.

16 >14
28
19
36
99

Jed remembered that the sum of 6 and 8 is 14. The next number in the column is a 9. If he remembered that 6 and 8 were 14, then he could use parts of the 9 to build to 20. 9 = ●●●●●● ●●● 14 and 6 = 20. Why? Then 20 and 3 = 23; 23 and the next number 6 = 29. Write 9 in ones place in the answer, and hold the 2 tens. Add the tens. Do you get 9 tens? How?

1. Add by building tens after you find a teens fact:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
19	26	12	16	34	18	29	16
8	17	18	19	17	19	38	15
7	35	17	28	15	25	18	39
26	17	13	18	15	16	14	14

Practice in Building Tens in Addition

Gordon's Home Town

Gordon lives in a small town. Everyone gets his own groceries, and the town is so small there are no errands to run. Gordon doesn't know how he can make any money.

Then he remembers that he can gather rubber and sell it to the junk man. This week he gathered 7 old rubber tires, 8 old rubber boots, and 9 rubber mats from people he knew. Find how many rubber things he gathered in all.

7 > 15
8
9

24

7 and 8 = 15. The **ending** of 15 is 5. You must remember the ending (5). Then you can think: 15 and 5 = 20; 20 and 4 = 24. Do you see that the parts of 9 (5 and 4) were used to build to 20?

Now that you are adding longer columns of figures, it is more important than ever to remember the endings. This should show how it will help you.

9
8 → ending is 7
8 → ending is 5
6

31

If you can remember that the ending of 9 + 8 (17) is 7, then you will know that you need to use the parts 3 (to get to 20) and 5 (3 and 5 are parts of the 8). 20 and 5 = 25. Remember the ending 5. 6 is the next figure in the column, so by remembering the ending 5, you can think 25 and 5 (part of 6) = 30. Then 30 + 1 = 31.

1. Add by building tens. Write the endings beside the numbers to help you remember them as in the example at the right.

9
6 → 5
6 → 1
3

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**	**k.**
7	8	9	5	8	5	8	9	7	8	6
8	9	9	9	8	7	4	6	4	3	8
6	5	5	3	5	6	6	7	5	5	6
1	2	2	7	3	4	3	2	7	6	5

Finding Ways to Make Money in the Country

Steven lives in the country. He gets discouraged when he hears about boys making money. He works at home, yes, but that is just part of his duty. He does not get money for it.

Steven thought and thought, but he could not think of a way to make money. Then one night just before he went to sleep he thought of three ways.

These are the ways Steven made money:

1. Steven remembered that bittersweet grows down by the river. He sold small bunches of it for 8¢ each. He sold 4 bunches one Saturday, 5 bunches the next Saturday, and then 6 bunches and 5 bunches this last Saturday. Find how many bunches he sold.

2. Steven gathered all the useless old iron that he could find. He sold this to the junkman. He weighed all the iron that he found. His first load of iron weighed 8 pounds, the next load weighed 19 pounds, the next weighed 27 pounds, and the last load weighed 15 pounds. Find the total number of pounds Steven gathered.

3. Mr. Jones lives on the farm next to Steven's home. He told Steven he could hitch up a horse and collect the old iron on his farm. Steven found 8 pounds, 17 pounds, 29 pounds, 16 pounds, and 27 pounds. Find how many pounds he got in all from Mr. Jones' farm.

4. Steven picked up all the walnuts he could find under the walnut trees by the gate. He can sell all his mother doesn't need. He takes some with him every time he goes to town. He sold 12 pounds, 9 pounds, and finally 15 pounds. How many pounds did he sell altogether?

5. Add:

16	25	37	18	29	17	38	17
18	29	18	15	35	17	19	26
36	17	36	29	21	38	27	19

Practice with Endings

46
+ 7

When you add the 4 tens and 6 ones and 7 ones, what will the figure in ones place be? How do you know?

1. Try these, telling how the ones *bridge* a ten:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
49	6	16	57	4	27	38	6
+ 6	+ 39	+ 29	+ 4	+ 37	+ 24	+ 6	+ 58

2. Add by writing the endings next to the figures in the column:

8	17	18	35	16	36	25	17
9	26	27	16	27	17	19	27
6	15	16	27	10	26	33	16
4	13	9	11	17	11	16	22

3. Do not copy these exercises; add them and put the answers on a sheet of paper:

28	14	19	18	18	23	16	14
32	27	29	14	9	18	19	29
10	34	16	27	36	8	22	18
17	16	17	28	19	11	20	21

4. Answer these questions about building tens and remembering *endings*:

In adding downward:

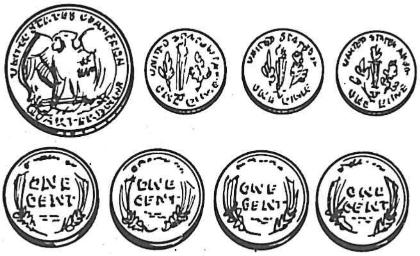
37
29
+ 16

a. Do you know the sum of 7 and 9? What is the ending?
b. What are the parts of 6 you use to build a ten?
c. What number is written in ones place in the answer?
d. How many tens are held to be added to the other tens?
e. How many tens are there altogether?

5. Add downward and check by adding upward:

45	12	37	38	17	18	44	31
16	34	16	17	36	29	16	17
15	18	21	12	15	31	18	24

The Boys Save Some Money



1. Bob is going to put some money in the bank at school. He has been selling empty bottles for two weeks. These are the coins he wants to put in the school bank.

Estimate the amount Bob will put into the bank. One way you could estimate would be to think that a quarter is 2 dimes and 1 nickel. Then 2 dimes + 1 nickel + 3 dimes = 5 dimes and 1 nickel. If you add 4 pennies to this amount, you will have almost 6 dimes, or 60¢. Why?

This is the way Bob made out his deposit slip. Correct his mistake, so that he will not lose money.

If Bob had first estimated the amount he was putting in the bank, he would have known something was wrong with his balance.

School Bank

Deposit to Bob Jones

Dollars	Cents
	25
	3
	4
Total	32

2. Jed is saving part of the money he earned delivering packages. How much money does the deposit slip above show he is putting into the bank?

3. Make a deposit slip and enter these amounts for deposit: 12¢, 4¢, 17¢, 2 dimes, and 1 penny. What is the total amount?

Jed's Delivery Business

Jed went to the grocery store the day before Halloween. He found there were more packages than he could deliver in one load. Everyone was getting ready for "Trick or Treat."

When he counted them, there were 32 packages in all. He could only take 17 of them on his first load. How many does he still have to deliver?

How many packages does Jed have to deliver in all?

How many packages did he take on the first load?

You can do the subtraction by using tens and ones:

$$\begin{array}{r} 32 \\ -\ 17 \\ \hline \end{array} = \begin{array}{r} \text{3 tens and 2 ones} \\ \text{1 ten and 7 ones} \\ \hline \end{array} = \begin{array}{r} \text{2 tens and 12 ones} \\ \text{1 ten and 7 ones} \\ \hline \text{1 ten and 5 ones} \end{array} = 15$$

Jed had 15 packages left to be delivered.

Why couldn't you use 32 or 3 tens and 2 ones when you subtracted?

Do you know your subtraction facts when subtracting the ones, like 7 from 12? Or do you have to think:

$$7 \text{ from } 12 = \begin{array}{r} 10 + 2 \\ -\ 7 \quad\ \ \\ \hline \end{array} = 3 + 2 = 5$$

Do you see that you thought of 12 as 10 and 2? You see a 7 within the 10. If you took 7 from 10 and 2, you would have 3 and 2 left; 3 and 2 are 5.

Try this again, because you may want to use it sometime. If you want to take 7 from 15, you can think of the 15 as 10 and 5. If you take 7 from 10 + 5, you have 3 + 5 left. 3 and 5 are 8, so 7 from 15 is 8:

$$\begin{array}{r} 15 \\ -\ 7 \\ \hline \end{array} = \begin{array}{r} 10 + 5 \\ -\ 7 \quad\ \ \\ \hline \end{array} = 3 + 5 = 8$$

1. Subtract, writing the tens number as 10 and some more:

a.	b.	c.	d.	e.	f.	g.	h.	i.
15	12	11	14	18	13	12	17	14
− 9	− 8	− 5	− 8	− 9	− 7	− 5	− 8	− 9
7	4							

Using Parts of 10 in Subtraction

1.
$$\begin{array}{r}64\\ -\ 38\\ \hline\end{array} = \begin{array}{r}6\text{ tens and }4\text{ ones}\\ -\ 3\text{ tens and }8\text{ ones}\\ \hline\end{array}$$

You cannot take 8 ones from 4 ones. Where can you get more ones so you can subtract?

If you do not know your teens subtraction facts, you will have to count or subtract the ones like this:

$$\begin{array}{r}64\\ -\ 38\\ \hline\end{array} = \begin{array}{r}5\text{ tens and }14\text{ ones}\\ -\ 3\text{ tens and }\ 8\text{ ones}\\ \hline\end{array} \qquad \begin{array}{r}14\\ -\ 8\\ \hline\end{array} = \begin{array}{r}10 + 4\\ -\ 8\quad\\ \hline 2 + 4 = 6\end{array}$$

2. Subtract, changing the number in ones place to a 10 and ones:

a.	b.	c.	d.	e.	f.	g.	h.
52	83	82	63	55	96	72	33
− 39	− 54	− 44	− 48	− 37	− 88	− 48	− 17

Some children, who do not know all of the subtraction facts, think this is an easier way:

$$\begin{array}{r}72\\ -\ 47\\ \hline\end{array} = \begin{array}{r}7\text{ tens and }2\text{ ones}\\ -\ 4\text{ tens and }7\text{ ones}\\ \hline\end{array}$$

Why can't you subtract the tens and ones as they are given?

$$\begin{array}{r}72\\ -\ 47\\ \hline\end{array} = \begin{array}{r}6\text{ tens and }12\text{ ones}\\ -\ 4\text{ tens and }\ 7\text{ ones}\\ \hline\end{array}$$

To subtract the ones, think:

$$\begin{array}{r}12\\ -\ 7\\ \hline\end{array} = 10 + 2 - 7 = 3 + 2 = 5$$

Another way to think the ones is like this:

$$\begin{array}{r}14\\ -\ 9\\ \hline\end{array} \quad \begin{array}{l}9\text{ from }14 = 10 + 4 - 9\\ 9\text{ from }14 = (9 + 1) + 4 - 9\\ 9\text{ from }14 = 1 + 4 = 5\end{array}$$

3. Tell what the child who subtracts this way is doing:

$$\begin{array}{r}62\\ -\ 39\\ \hline\end{array} = \begin{array}{r}{\scriptstyle 10}\\ 52\\ -\ 39\\ \hline\end{array} = \begin{array}{r}{\scriptstyle 9 + 1}\\ 52\\ -\ 39\\ \hline\end{array} = \begin{array}{r}{\scriptstyle \cancel{9} + 1}\\ 52\\ -\ 3\cancel{9}\\ \hline 23\end{array}$$

4. Subtract:

a.	b.	c.	d.	e.	f.	g.	h.
44	46	63	51	85	82	67	78
− 25	− 19	− 27	− 15	− 39	− 38	− 28	− 49

Steven Goes to the Big City

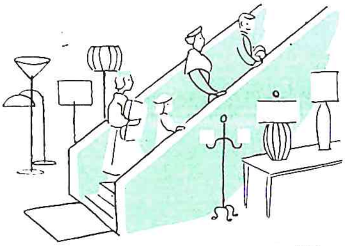
Steven saved every cent of the money he earned from selling old iron, bittersweet, and walnuts. His mother and father let him go to the city Friday evening on a bus. His aunt met him. Steven took 95¢ with him.

1. The first thing Steven did the next morning was to go with his aunt to the zoo. He had never seen a real bear or elephant in his life.

Steven bought 2 bags of peanuts for 10¢ to feed to the monkeys. How much change should he receive from a quarter?

2. Steven bought a hot dog for himself. It cost 15¢. How much does he have left out of 95¢?

3. Steven bought a hot dog and a cup of coffee for his aunt. They cost 25¢ in all. Now how much money does he have left?



4. That afternoon, Steven's aunt took him to one of the big stores so he could see a moving stairway. He made 8 trips on the stairway because it was so much fun. He wanted to make 25 trips, but his aunt said they did not have time. How many more trips did he want to make?

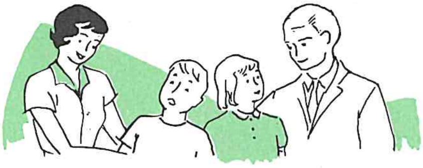
5. Does Steven have enough money left to buy a 5¢ candy bar for himself and his aunt? Will he have any money left, and if so, how much?

6. Steven ran to the grocery store for his aunt when they got home. He bought a loaf of bread for 18¢ and a head of lettuce for 14¢. How much change should he receive from a half-dollar?

7. See how many of these facts you know. Write any you do not know, and show how you get the answer by using parts of 10.

15	19	18	14	11	17	14	13	12	15	14	16	12
− 9	− 9	− 9	− 6	− 4	− 8	− 5	− 6	− 7	− 8	− 9	− 7	− 9

Problems and Exercises



$$\begin{array}{r} 9 \\ +\ 5 \\ \hline 14 \end{array} \qquad \begin{array}{r} 14 \\ -\ 9 \\ \hline 5 \end{array} \qquad \begin{array}{r} 14 \\ -\ 5 \\ \hline 9 \end{array}$$

Related Facts—Addition and Subtraction

There are families in numbers just as there are families of animals and people. One part of the family of numbers is addition and the other part is subtraction.

$$\begin{array}{r} 2 \text{ people} \\ +\ 3 \text{ people} \\ \hline 5 \text{ people} \end{array} \qquad \begin{array}{r} 5 \text{ people} \\ -\ 3 \text{ people} \\ \hline 2 \text{ people} \end{array} \qquad \begin{array}{r} 5 \text{ people} \\ -\ 2 \text{ people} \\ \hline 3 \text{ people} \end{array}$$

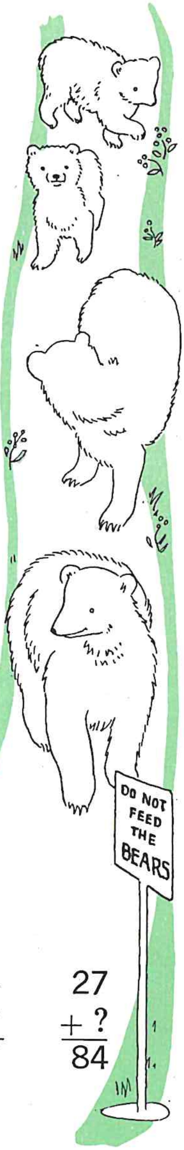
Do you see that when the parts of the family were added, you found the total number in the family? When you know how many there are in the total, you can subtract either part and find the other part. Do you see that you *label* the parts and the whole: 3 people, 2 people, 5 people?

Let's see how some related stories work:

$$\begin{array}{r} 7 \\ +\ 6 \\ \hline 13 \end{array} \qquad \begin{array}{r} 17 \\ +\ 6 \\ \hline 23 \end{array} \qquad \begin{array}{r} 27 \\ +\ 6 \\ \hline 33 \end{array} \qquad \begin{array}{r} 37 \\ +\ 6 \\ \hline 43 \end{array}$$

$$\begin{array}{r} 13 \\ -\ 6 \\ \hline 7 \end{array} \qquad \begin{array}{r} 23 \\ -\ 6 \\ \hline 17 \end{array} \qquad \begin{array}{r} 33 \\ -\ 6 \\ \hline 27 \end{array} \qquad \begin{array}{r} 43 \\ -\ 6 \\ \hline 37 \end{array}$$

$$\begin{array}{r} 13 \\ -\ 7 \\ \hline 6 \end{array} \qquad \begin{array}{r} 23 \\ -\ 17 \\ \hline 6 \end{array} \qquad \begin{array}{r} 33 \\ -\ 27 \\ \hline 6 \end{array} \qquad \begin{array}{r} 43 \\ -\ 37 \\ \hline 6 \end{array}$$



Tell the missing numbers:

$$\begin{array}{r} 19 \\ +\ 5 \\ \hline ? \end{array} \quad \begin{array}{r} 24 \\ -\ 5 \\ \hline ? \end{array} \quad \begin{array}{r} 24 \\ -\ ? \\ \hline 19 \end{array} \quad \begin{array}{r} 16 \\ +\ 17 \\ \hline ? \end{array} \quad \begin{array}{r} 33 \\ -\ 11 \\ \hline ? \end{array} \quad \begin{array}{r} 33 \\ -\ ? \\ \hline 16 \end{array} \quad \begin{array}{r} 84 \\ -\ 27 \\ \hline ? \end{array} \quad \begin{array}{r} 84 \\ -\ ? \\ \hline 27 \end{array} \quad \begin{array}{r} 27 \\ +\ ? \\ \hline 84 \end{array}$$

Practice in Subtraction

Now it is time for you to use subtraction facts instead of having to use the parts of 10.

$$\begin{array}{r} 54 \\ -\ 28 \\ \hline \end{array}$$

You know without writing them that you have 5 tens and 4 ones from which you are going to subtract 2 tens and 8 ones.

$$\begin{array}{r} 54 \\ -\ 28 \\ \hline 6 \end{array}$$

You know that you begin by subtracting the ones. You cannot take 8 ones from 4 ones. You use 1 of the 5 tens which gives you 10 ones. Then you think: 10 ones and 4 ones = 14 ones. 8 ones from 14 ones = 6 ones. Write 6 in ones place in the answer.

$$\begin{array}{r} 54 \\ -\ 28 \\ \hline 26 \end{array}$$

You have 4 of the tens left, because you used 1 of them to give you more ones. 2 tens from 4 tens = 2 tens. Write 2 in tens place in the answer. The difference is 26.

Subtract, using subtraction facts:

	a.	b.	c.	d.	e.	f.	g.	h.	i.
1.	35 9	42 6	48 9	31 7	52 4	63 7	21 5	44 6	54 9
2.	72 9	76 8	41 3	65 8	83 5	77 9	54 7	66 33	72 4
3.	63 29	78 59	91 26	60 47	57 18	41 18	70 44	63 10	47 29
4.	74 35	61 19	45 18	62 57	38 25	56 26	77 54	18 12	30 18

	a.	b.	c.	d.	e.
5.	66¢ 59¢	58¢ 19¢	\$.74 \$.36	\$.62 .17	\$.35 .15

f. \$.65 – \$.46 = ?

g. \$.70 – \$.19 = ?

h. \$.44 – \$.20 = ?

i. \$.75 – .05 = ?

6. What are the related subtraction facts for these?

a. 9 + 8 = 17

b. 6 + 9 = 15

c. 4 + 9 = 13

d. 5 + 8 = 13

e. 5 + 6 = 11

f. 6 + 8 = 14

Using the Addition Way in Subtraction

Tim's grandmother says, "There is more than one way to do everything." If she can not find one way to do a thing, she works until she finds another way to do it.

Tim has just about figured a way that will help him in subtraction. He wants to know how much taller Joe is than Bruce. He knows that he is comparing two numbers; so he writes this subtraction:

$$\begin{array}{r} 58 \text{ inches} \\ -\ 53 \text{ inches} \\ \hline \end{array}$$

Tim thinks: 3 and how many more are 8? He knows right away that it is 5.

Now he subtracts the tens: 5 tens from 5 tens = 0 tens. He could put a zero in tens place, but he does not need it. Why?

$$\begin{array}{r} 58 \\ -\ 53 \\ \hline 5 \end{array}$$

Try this one:

$$\begin{array}{r} 43 \\ -\ 28 \\ \hline \end{array}$$

Can you take 8 from 3? What do you do?

Now you are going to subtract 8 from 13. You can think: 8 and how many more are 13? If you know your addition, you will know at once that it is 5; 8 and 5 are 13. Write 5 in ones place in the answer.

$$\begin{array}{r} 43 \\ -\ 28 \\ \hline 5 \end{array}$$

Now you are ready to subtract the tens. How many tens do you have after you have used 1 ten to give you more ones?

Two tens and how many more are 3 tens? Write the 1 in tens place in the answer. The difference is 15.

$$\begin{array}{r} 43 \\ -\ 28 \\ \hline 15 \end{array}$$

1. Subtract by using addition to help you:

a. $\begin{array}{r} 82 \\ -\ 48 \\ \hline \end{array} = \begin{array}{r} 7 \text{ tens and } 12 \text{ ones} \\ -\ 4 \text{ tens and } 8 \text{ ones} \\ \hline \end{array}$

b. $\begin{array}{r} 66 \\ -\ 49 \\ \hline \end{array} = \begin{array}{r} ? \text{ tens and } ? \text{ ones} \\ -\ 4 \text{ tens and } 9 \text{ ones} \\ \hline \end{array}$

2. Subtract:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
43	50	55	95	77	81	76	92	41
38	28	39	58	69	57	38	65	17

Toby Delivers Advertisements

Mr. Brown told Toby he would pay him for delivering advertisements to his customers on Monday, Wednesday, Friday, and Saturday.

Toby found that he walked 18 blocks delivering the flyers and getting back home on each of these 4 days. He wants to know how many blocks he walked in all. Could he find the answer by addition? by multiplication? Why?

$$\boxed{\begin{array}{rr} 18 & \\ 18 & 18 \\ 18 & \underline{\times 4} \\ \underline{+\,18} & \end{array}}$$

To multiply 4 × 18 means you are going to take 18 four times. (Can you see why multiplication and addition are so much alike?)

First, before you begin to multiply, estimate your answer. What do you think four 18's will be? You might start out by thinking what two 18's are. (18 is close to 20, so it may be easier for you to think what two 20's are.) Then *about* how much would four 18's or four 20's be? You know now that the answer is close to 80.

$$\begin{array}{r} 18 \\ \underline{\times 4} \end{array} = \begin{array}{c} \text{1 ten and 8 ones} \\ \underline{\qquad\qquad\times 4} \\ \text{4 tens and 32 ones} \\ \text{or} \\ \text{7 tens and 2 ones} \end{array}$$

Multiply the ones. 4 × 8 ones = 32 ones.

Multiply the tens. 4 × 1 ten = 4 tens. Take 32 single ones, and see how many groups of 10 ones you can make. Do you have 3 groups of 10 ones and 2 ones left? 32 ones = 3 tens and 2 ones. If you add the 3 tens (from the 32 ones) to the four tens, you will have 7 tens in all. The answer is 7 tens and 2 ones, or 72.

1. Multiply, writing the tens and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
14	16	19	13	12	26	15	17
× 6	× 3	× 2	× 5	× 6	× 2	× 5	× 3

2. Multiply by thinking tens and ones:

18	15	13	17	14	19	13	12
× 2	× 4	× 6	× 4	× 4	× 4	× 5	× 8

Toby Learns a Shorter Way

Toby learned a shorter way to multiply in school the next day. He did his work by thinking the tens and the ones.

$$\begin{array}{r} 18 \\ \times 4 \\ \hline 2 \end{array}$$

Multiply the ones: 4 × 8 ones = 32 ones. 32 ones = 3 tens and 2 ones. Write 2 in ones place in the answer. Hold the 3 tens in your head until you have multiplied the 1 ten by 4. Then, add all the tens together.

$$\begin{array}{r} 18 \\ \times 4 \\ \hline 72 \end{array}$$

Multiply the tens: 4 × 1 ten = 4 tens. Now add the 3 tens you held from the 32 ones to the 4 tens and you have 7 tens. Write 7 in tens place in the answer. The answer is 72.

Multiply by holding the tens:

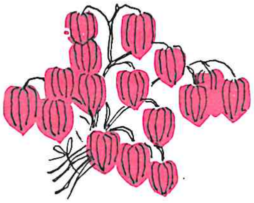
	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
1.	19 × 2	15 × 5	16 × 3	13 × 6	12 × 5	18 × 2	14 × 4	16 × 2	12 × 7
2.	21 × 3	16 × 6	24 × 3	32 × 3	16 × 4	22 × 4	35 × 2	17 × 2	19 × 3

Problems:

3. On Tuesday Toby made some more money cutting grass. It took him 35 minutes to finish each of two lawns. How many minutes did he work altogether on Tuesday?

4. He earned $.45 for cutting each of these two lawns. How much did he collect for both of them?

5. Toby needed three books for school. He decided to use some of the money he earned that week to buy them. Each book cost $.18. What did he pay for the 3 books?



Girls Can Make Money, Too

Nancy came into the house after school. She was very upset.

"Mother! It just isn't fair! The boys get to make all the money. There is no way for a girl to make any!"

Nancy's mother said, "We may be able to think of a way." Grandmother said, "I know that Mrs. Stone is giving a party and wants some fall leaves."

Sure enough, Mrs. Stone said she would pay Nancy 15¢ for every large bouquet of leaves she brought her. Find how much Nancy received for 3 bouquets.

If Mrs. Cone buys 5 bouquets, what will they cost her?

1. Nancy's mother said that she could paint magnolia leaves gold and silver and sell them. Nancy found that some of the women wanted only 1 or 2 branches; so she sells them by the branch. She gets different prices for them, because some of them have more leaves than others. Find how much each of these customers paid Nancy:

a. Mrs. Stoll bought 2 branches at 16¢ each.

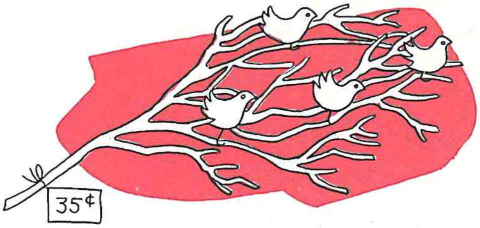
b. Mrs. Adams bought 4 branches at 18¢ apiece.

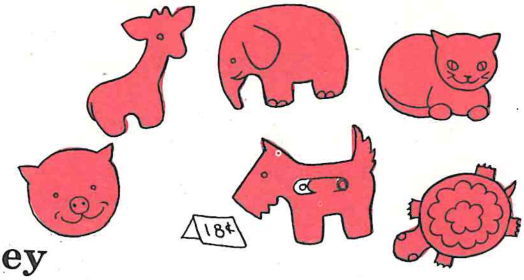
2. Nancy is glad that she raised asters in her garden. She puts 12 asters in a bouquet and sells each bouquet like this for 20¢ each.

Mrs. Ball bought 2 bouquets. Find how much these cost her.

3. $\begin{array}{r}23\\ \times 4\\ \hline\end{array}$ $\begin{array}{r}15\\ \times 2\\ \hline\end{array}$ $\begin{array}{r}18\\ \times 4\\ \hline\end{array}$ $\begin{array}{r}16\\ \times 3\\ \hline\end{array}$ $\begin{array}{r}27\\ \times 2\\ \hline\end{array}$ $\begin{array}{r}17\\ \times 3\\ \hline\end{array}$ $\begin{array}{r}13\\ \times 5\\ \hline\end{array}$ $\begin{array}{r}25\\ \times 2\\ \hline\end{array}$ $\begin{array}{r}18\\ \times 3\\ \hline\end{array}$

Practice Problems and Exercises



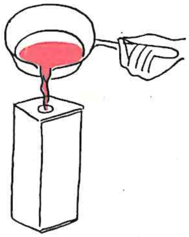


Nancy Makes More Money

Nancy finds branches that she paints white. She buys sheets of tin foil to make birds. She puts the birds on the branches.

Nancy makes fancy pins out of small pieces of felt. She puts cotton inside to make the body parts. She sews beads and sequins on them.

Nancy makes her own candles out of paraffin and wicking. After the candles have hardened, she dips the can in hot water to get the candle out. This makes the outside of the candle warm and soft. Then Nancy decorates the candles with beads, sequins, and snow sparkles.



1. Nancy sold 3 pins to Mrs. Johns at 18¢ each. Find the total amount Mrs. Johns must pay for the 3 pins.

2. Nancy sold a branch-and-bird decoration and 4 candles to Mrs. Steen. The branch-and-bird decoration is 35¢, and each of the candles is 15¢. How much should Mrs. Steen have given Nancy?

3. The lady next door bought 2 candles and a turtle pin. Find how much Nancy received from this sale.

4. One night after school, Nancy took her pins and went to many houses. She sold 3 pins in all. Find how much money she made on these.

5. Mrs. Gray is giving a party. She wants 3 branch-and-bird decorations to put on her table. How much will they cost?

6. Multiply:

$$\begin{array}{r}18\\ \times 4\\ \hline\end{array}\quad\begin{array}{r}14\\ \times 5\\ \hline\end{array}\quad\begin{array}{r}26\\ \times 2\\ \hline\end{array}\quad\begin{array}{r}15\\ \times 6\\ \hline\end{array}\quad\begin{array}{r}17\\ \times 4\\ \hline\end{array}\quad\begin{array}{r}19\\ \times 3\\ \hline\end{array}\quad\begin{array}{r}14\\ \times 5\\ \hline\end{array}\quad\begin{array}{r}12\\ \times 5\\ \hline\end{array}\quad\begin{array}{r}16\\ \times 4\\ \hline\end{array}$$

Practice in Multiplying

Nancy Is As Happy As a Bird

Nancy is so happy. She has her pockets full of money, and she can spend some of it every night after school.

1. Nancy spent 15¢ every day after school for 5 days. How much did she spend in all five days? Can you think of two ways to do this problem?

2. Nancy decided she was spending too much money. She is going to put some of it in the bank in her room. She put 18¢ in the bank each week for 4 weeks. How much did she put in altogether?

3. Nancy gives her little brother 8 pennies every week. How much does she give him in a month? Do the problem two ways:

Adding:	Multiplying:
8¢	
8¢	8¢
8¢	× 4
8¢	?
?	

4. Nancy made 3 candles one night, 2 the next night, 5 on Saturday, and 4 on Monday. She wants to multiply, but she finds she can not use it in this problem. Why?

5. Multiply where you can; add the others:

6	9	7	9	17	14	5	9	4	6
6	6	7	9	21	10	5	3	4	1
6	4	7	9	12	14	5	4	4	6
6	2		9	30	10		8	4	4
6	0		9	23	14		1	4	

6. Add to find the sums; then do the problems by multiplication:

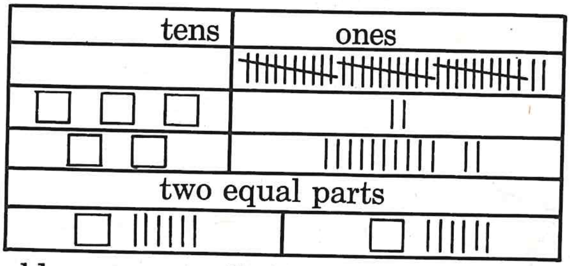
10	9	18	15	17	13	16	14
10	9	18	15	17	13	16	14
10	9	18	15	17	13	16	14
10	9	18	15	17	13	16	14

Nancy and Joan Have a Plan

Nancy and Joan are gathering all the wooden clothes hangers they can find. They are going to cover each of them with cloth and sell them.

They collected 32 in all. They want to divide them into 2 equal parts. How many would each have?

32 = 32 ones
32 = 3 tens and 2 ones
32 = 2 tens and 12 ones



Which one of these ways would you use to divide?

$$2\overline{)32} = \begin{array}{r l} & \text{1 ten } + \text{ 6 ones} \\ 2 \big) & \overline{\text{3 tens} + \text{2 ones}} \\ & \underline{\text{2 tens}} \\ & 1 \qquad + 2 \\ \text{or} & \text{12 ones} \\ & \underline{\text{12 ones}} \end{array} \quad \text{or} \quad \begin{array}{r l} & \text{1 ten } + \text{ 6 ones} = 16 \\ 2 \big) & \overline{\text{2 tens} + \text{12 ones}} \\ & \underline{\text{2 tens}} \\ & \text{12 ones} \\ & \underline{\text{12 ones}} \end{array}$$

Tell why.

Each girl would receive 16 clothes hangers.

1. Divide these by writing the tens and ones: 2)58, 2)38

	a.	**b.**	**c.**	**d.**
2.	3)42 = ?	4)52 = ?	2)34 = ?	3)45 = ?
3.	4)56 = ?	3)51 = ?	5)65 = ?	3)75 = ?

4. Let's see if you can do division without writing out the tens and ones:

$$\begin{array}{r} 18 \\ 2\overline{)36} \\ \underline{2} \\ 16 \\ \underline{16} \end{array}$$

Explain the work here.
The answer is ? ten and ? ones = ?

a.	**b.**	**c.**	**d.**	**e.**	**f.**
3)51	5)85	4)56	6)78	2)34	5)95

Happy Treats His Friends

Happy likes everybody, and everybody likes Happy. Today he is going to treat his friends. He doesn't always buy something for them, but he does a lot of nice things—like letting them use his bike, or making a fishing pole for them out of a stick and some string.

Happy got 63¢ for raking leaves, and he wants to know if he can buy an ice cream cone for each of the 9 boys in his scout pack. If cones cost 7¢ each, does Happy have enough money?

Happy started with 63¢, and kept taking 7¢ away until he had 9 ice cream cones paid for. He found that it came out even for the 9 cones.

What do you suppose Happy would have done if he had had only 60¢?

The subtracting took Happy so long that he said he would find a shorter way. Happy tried dividing:

$$7\text{¢}\overline{)\,6\text{ dimes and }3\text{ pennies}}$$

$$\begin{array}{r}
63\text{¢}\\
\underline{-\ 7\text{¢}}\\
56\text{¢}\\
\underline{-\ 7\text{¢}}\\
49\text{¢}\\
\underline{-\ 7\text{¢}}\\
42\text{¢}\\
\underline{-\ 7\text{¢}}\\
?
\end{array}$$

and so on.

Happy knew that he could not divide 6 dimes into groups of 7¢ each. He had to use the 63¢ as 63 pennies.

This is the way he divided:

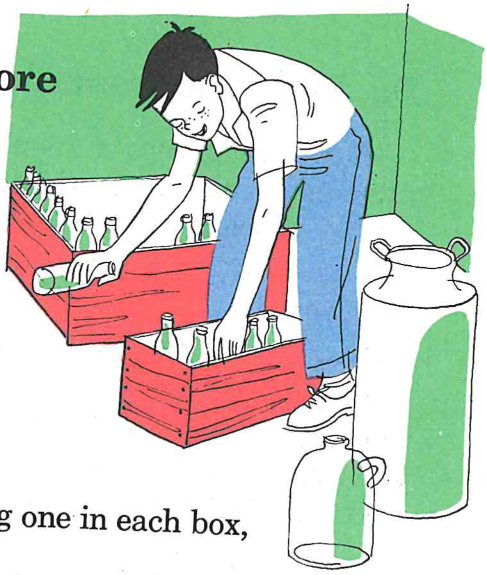
63¢ has other parts in ones besides 60 + 3. He looked for a part that he knew as a division fact: $7\text{¢}\overline{)14\text{¢}}$, $7\text{¢}\overline{)21\text{¢}}$, $7\text{¢}\overline{)28\text{¢}}$, $7\text{¢}\overline{)35\text{¢}}$.

He used 35 as one of the parts, and 63 − 35 = 28 as the other part. He wrote:

$$\begin{array}{rcrrcl}
 & & & 5 & + & 4\ = 9\\
7\text{¢}\overline{)63\text{¢}} & = & 7\text{¢}\big) & \overline{35\text{¢}} & \overline{+} & \overline{28\text{¢}}\\
 & & & \underline{35\text{¢}} & & \\
 & & & & & 28\text{¢}\\
 & & & & & \underline{28\text{¢}}
\end{array}$$

Happy could buy 9 cones.

Tom Works at the Drug Store

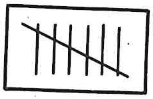


Tom earns money by doing odd jobs at a drug store. One day he was asked to put empty bottles from a large box into smaller ones.

1. The label on the large box said there were 84 bottles in it. The druggist wanted the number of bottles divided equally and put into 6 small boxes. How do you think Tom will go about doing this?

a. Can he divide the bottles by putting one in each box, and counting? How would he do this?

b. Can he take 6 at a time and put 1 in each of the 6 boxes? How would he find the total number in each box? Would he have to count them, or could he mark the number of times he took 6 bottles, and then count the marks? This is how he could keep track of the number of bottles.



c. Can he find 6 equal parts in 84 by this method?

$6\overline{)84} = 6\overline{)8 \text{ tens and } 4 \text{ ones}} = 6\overline{)6 \text{ tens and } 24 \text{ ones}}$? Why?

d. $6\overline{)84} = ?$ tens + ? ones = ?

Can you do the division by thinking the tens and ones?

$$\begin{array}{r} 6\overline{)84} \\ 6 \\ \hline 2 \end{array}$$

Explain this step.

$$\begin{array}{r} 14 \\ 6\overline{)84} \\ 6 \\ \hline 24 \\ 24 \\ \hline \end{array}$$

Explain this step.

The answer is ? bottles in each box.

2. Finish these exercises:

a.
$$\begin{array}{r} 1 \\ 4\overline{)64} \\ 4 \\ \hline \end{array}$$

b.
$$\begin{array}{r} 1 \\ 5\overline{)70} \\ 5 \\ \hline 20 \end{array}$$

c.
$$\begin{array}{r} 1 \\ 8\overline{)88} \\ 8 \\ \hline \end{array}$$

d.
$$\begin{array}{r} ?8 \\ 4\overline{)72} \\ 4 \\ \hline \end{array}$$

e.
$$\begin{array}{r} ? \\ 3\overline{)42} \\ ? \\ \hline 12 \end{array}$$

f.
$$\begin{array}{r} 2\overline{)38} \\ 2 \\ \hline \end{array}$$

Do You Understand Finding How Many Groups?

How many groups of 7 are there in 91? Do you see that division can be done by thinking that the whole (a number like 91 which is going to be divided) has:

a. parts that can be thought of as *ones*:

$7\overline{)91} = 7\overline{)70 \text{ ones and } 21 \text{ ones}}$

b. parts that can be thought of as *tens* and *ones*:

$7\overline{)91} = 7\overline{)7 \text{ tens and } 21 \text{ ones}}$

In **a**, how many groups of 7 are there in 70? You know that there are 10 (10 × 7 = 70) or 1 ten group. Then you can see that the number of groups of 7 in 7 tens ($7\overline{)7 \text{ tens}}$) is 1 ten. Hence:

$$\begin{array}{l} 1 \text{ ten} \ + \ \ 3 \text{ ones} = 13 \\ 7\overline{)7 \text{ tens} + 21 \text{ ones}} \end{array}$$

Let's try another one: How many groups of 6 are there in 96? You think:

$6\overline{)96} = ?$

$$\begin{array}{r} 16 \\ 6\overline{)96} \\ 6 \\ \hline 36 \\ 36 \\ \hline \end{array}$$

It is difficult to find the number of groups of 6 in 9 tens. You use 6 of the 9 tens. How many groups of 6 (or how many 6's) are there in 6 tens? You know that the answer is 1 ten. You have 3 tens and 6 ones which have not been used. Explain how 6 ones is found for the answer.

1. Divide by thinking how many groups there are in the tens and ones:

$4\overline{)76}$ $5\overline{)85}$ $6\overline{)78}$ $3\overline{)81}$ $3\overline{)45}$ $2\overline{)38}$ $6\overline{)90}$

$5\overline{)65}$ $7\overline{)77}$ $9\overline{)99}$ $4\overline{)68}$ $3\overline{)39}$ $5\overline{)95}$ $6\overline{)84}$

2. How many groups of 7 jacks each are there in a bag containing 84 jacks?

3. How many candy apples at 8¢ each can Mary buy with 90¢? Will she have any money left over? If so, how much? (Show your work.)

4. Sandy can pick up 3 oranges at a time with one hand. How many handfuls must he take to have 4 doz. oranges?

Doris and Stan Have Different Problems

Doris is going to share some chocolate buds with 2 of her friends. She has 45 pieces of candy.

$3\overline{)45}$ pieces

$$\begin{array}{r} 15 \\ 3\overline{)45} \\ \underline{3} \\ 15 \\ \underline{15} \end{array}$$

Each girl will get ? pieces of candy.

What does the problem tell you about Doris' candy?

? = total number of pieces of candy.

? = the **number of equal parts** Doris wants.

What did Doris find by dividing?

Stan wants to divide a group of 96 doughnuts into small groups of $\frac{2}{3}$ doz. each. How many groups should he get?

8 doughnuts$\overline{)96 \text{ doughnuts}}$

$$\begin{array}{r} 12 \\ 8\overline{)96} \\ \underline{8} \\ 16 \\ \underline{16} \end{array}$$

He will have ? groups.

What does the problem tell you about the doughnuts?

96 = ?

? = the **size of each of the parts** into which the total number of doughnuts was to be divided.

What did Stan find by dividing?

Were your answers *size of a part* or *number of parts*?

1. Doris bought 84 in. of ribbon. She wants 3 equal lengths. How long will each be?

2. Stan bought a board 98 in. long. He needed some pieces of wood 7 in. long to make picture frames. How many pieces of this length could he get out of the board?

2 Kinds of Division Problems

The All American Club

Happy asked all the boys to come to his house. They sat on the grass in the backyard and made up a club. They named their club the All American Club.

1. Jim is making a secret badge for each boy to carry with him. It takes Jim 30 minutes to make 3 of them. How long will it take him to make 9 of them?

2. Each boy has to swim 100 feet in 2 minutes. If Jerry can swim 5 feet in 3 seconds, how long does it take him to swim the 100 feet?

3. Jerry's mother made 2 dozen cookies for one of the club meetings. There are now 8 boys in the club. How many cookies could each boy have?

4. The boys rented an old cabin on the north side of town. Mr. Black is their friend, and he said they could have it for 96¢ a month. How much will each boy have to pay every month if they share the cost equally?

5. The boys have a code of secret words. There are 48 secret words. Each of the 8 boys made up an equal number. How many did each make up?

6. Divide:

a.	b.	c.	d.	e.	f.	g.
2)86	3)54	5)75	2)62	3)$.84	4)$.92	3)$.36

7. Add:

37¢	28¢	$.31	$.25	$.13	$.55	$.19
6¢	4¢	.49	.68	.77	.38	.48

8. Subtract:

93¢	21¢	73¢	37¢	$.20	$.42	$.73
17¢	13¢	26¢	18¢	.14	.28	.48

9. Multiply:

23	16	43	12	16	$.06	$.22
× 4	× 5	× 2	× 6	× 3	× 7	× 4

The Shadow Club

The girls started a club. Susan's brother said they were copycats, but Susan said they had the idea a long time before the boys even thought of a club. The girls call their club the Shadow Club.

1. The Shadows have to pay club dues. They pay 2¢ a week. How much do they pay each month?

2. Rose brought a box of candy to a club meeting to share with the other girls. There are 24 pieces. How many pieces may each of the 6 girls have if the candy is divided equally?

3. Helen told the girls of a way in which they could make money for their club. They can sell cards of buttons with 6 buttons on each card. The girls can make 6¢ on each card of buttons they sell. Find how much they can make on 12 cards.

4. Marjorie made 96¢ for the club. How many cards of buttons did she sell?

5. The Shadows decided to go over to Grandma Arn's house and pick her apples for her—just because they wanted to help her. Four of the Shadows picked 88 apples. If they picked equal amounts, how many were there in each girl's part?

6. Mrs. Arn was glad that her apples were picked, because she was not very well. The Shadows would not take any money, so Mrs. Arn let them pick out their favorite scraps of ribbon from her ribbon box. There were 36 scraps. How many did each girl get if the scraps were shared equally?

7. $3\overline{)38} = 12$ R2 (Remainder 2) Why?

Divide:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
8.	$3\overline{)28}$	$7\overline{)98}$	$4\overline{)77}$	$5\overline{)85}$	$7\overline{)29}$	$3\overline{)56}$	$2\overline{)30}$
9.	$7\overline{)81}$	$5\overline{)60}$	$9\overline{)99}$	$6\overline{)80}$	$4\overline{)52}$	$10\overline{)40}$	$2\overline{)28}$
10.	$5\overline{)45}$	$8\overline{)73}$	$3\overline{)67}$	$8\overline{)94}$	$2\overline{)9}$	$4\overline{)78}$	$8\overline{)16}$

Do You Remember?

1. Add by writing tens and ones:

$$\begin{array}{r}27\\+\ 34\\\hline ?\end{array} = \begin{array}{l}\text{2 tens and 7 ones}\\\text{3 tens and 4 ones}\\\hline\end{array} = ? \qquad \begin{array}{r}49\text{¢}\\16\text{¢}\\\hline\end{array} \qquad \begin{array}{r}\$.58\\.27\\\hline\end{array} \qquad \begin{array}{r}64\text{¢}\\29\text{¢}\\\hline\end{array} \qquad \begin{array}{r}\$.14\\.68\\\hline\end{array}$$

2. Add by building tens:

$$\begin{array}{r}18\text{¢}\\6\text{¢}\\9\text{¢}\\7\text{¢}\\\hline\end{array} \quad \begin{array}{r}35\text{¢}\\15\text{¢}\\28\text{¢}\\19\text{¢}\\\hline\end{array} \quad \begin{array}{r}7\text{¢}\\36\text{¢}\\10\text{¢}\\25\text{¢}\\\hline\end{array} \quad \begin{array}{r}6\text{¢}\\48\text{¢}\\7\text{¢}\\9\text{¢}\\\hline\end{array} \quad \begin{array}{r}\$.34\\.08\\.36\\.07\\\hline\end{array} \quad \begin{array}{r}\$.23\\.28\\.13\\.19\\\hline\end{array} \quad \begin{array}{r}\$.30\\.16\\.28\\.07\\\hline\end{array} \quad \begin{array}{r}\$.55\\.14\\.19\\.03\\\hline\end{array}$$

3. Subtract by writing tens and ones:

$$\begin{array}{r}53\\-\ 34\\\hline\end{array} = \begin{array}{l}\text{4 tens and 13 ones}\\\text{3 tens and 4 ones}\\\hline\end{array} = ? \qquad \begin{array}{r}95\text{¢}\\17\text{¢}\\\hline\end{array} \qquad \begin{array}{r}63\text{¢}\\36\text{¢}\\\hline\end{array} \qquad \begin{array}{r}\$.84\\.39\\\hline\end{array} \qquad \begin{array}{r}\$.82\\.59\\\hline\end{array}$$

4. Subtract, using take-away facts:

$$\begin{array}{r}50\text{¢}\\23\text{¢}\\\hline\end{array} \quad \begin{array}{r}83\text{¢}\\61\text{¢}\\\hline\end{array} \quad \begin{array}{r}96\\54\\\hline\end{array} \quad \begin{array}{r}\$.53\\.34\\\hline\end{array}$$

5. Subtract, using addition facts:

$$\begin{array}{r}63\text{¢}\\46\text{¢}\\\hline\end{array} \quad \begin{array}{r}\$.84\\.39\\\hline\end{array} \quad \begin{array}{r}70\\24\\\hline\end{array} \quad \begin{array}{r}41\\27\\\hline\end{array}$$

6. Multiply by writing tens and ones:

$$\begin{array}{r}24\\\times 2\\\hline\end{array} = \begin{array}{r}\text{2 tens and 4 ones}\\\times 2\\\hline\end{array} = ? \qquad \begin{array}{r}13\text{¢}\\\times 3\\\hline\end{array}$$

7. Multiply:

$$\begin{array}{r}\$.12\\\times 6\\\hline\end{array} \quad \begin{array}{r}32\\\times 3\\\hline\end{array} \quad \begin{array}{r}14\\\times 7\\\hline\end{array} \quad \begin{array}{r}23\\\times 4\\\hline\end{array}$$

8. What is the size of 1 part?

$$3\overline{)87\text{¢}} \quad 4\overline{)68} \quad 6\overline{)90} \quad 5\overline{)\$.80}$$

9. How many groups?

$$3\text{¢}\overline{)63\text{¢}} \quad 5\overline{)95} \quad 4\text{¢}\overline{)\$.92}$$

10. John spent the following amounts on a trip down town: 36¢, 9¢, 27¢, 8¢. How much did he spend in all?

11. Did John have any money left from 90¢ after he spent the amounts in Problem 10? If so, how much?

12. If erasers cost 15¢ each, what would you pay for a half-dozen?

13. Mary sees greeting cards advertised at 5 for 95¢. At this price, what would she be paying for each card?

Let's Check Your Understandings

1. Name the tens and ones in each of the following:

30 $.56 48

2. Write 94 in tens and ones in all of the possible ways.

3. Add by building tens: **4.** Add by writing tens and ones:

38	19	8	7	6	35	47	8
37	9	27	49	6	18	9	29
+ 20	+ 30	+ 46	+ 7	+ 6	+ 46	+ 16	+ 8

5. Find the endings in these exercises:

a. 17 + 8 **b.** 49 + 6 **c.** 27 + 46 **d.** 15 + 15 + 15

6. Subtract (think take-away facts): **7.** Subtract (think addition facts):

96	32	82	35	9	42	73	55
− 49	− 9	− 64	− 18	− 6	− 16	− 28	− 29

8. Multiply: **9.** Multiply:

$\begin{array}{r}29\\ \times 3\\ \hline\end{array} = \begin{array}{c}?\text{ tens} + \quad ?\text{ ones}\\ \times 3\\ \hline\end{array}$

15	28	16	27
× 4	× 3	× 4	× 3

10. $4\overline{)92} = 4\overline{)9\text{ tens and }2\text{ ones}} = 4\overline{)\ ?\ \text{ tens and }\ ?\ \text{ ones}} = \ ?\ .$

11. $6\overline{)72} = 6\overline{)60\text{ ones and }12\text{ ones}} = \ ?\ .$

12. Divide, thinking tens and ones:

$2\overline{)44\text{ in.}}$ $2\overline{)74¢}$ $3\overline{)54\text{ ft.}}$ $4\text{ ft.}\overline{)68\text{ ft.}}$ $3¢\overline{)75¢}$ $4\text{ lb.}\overline{)72\text{ lb.}}$

13. Sue spent 49¢ of her allowance for the week for a ribbon. If her weekly allowance was 75¢, how much did she have left?

14. Joe bought hinges for his dog house at 37¢ a pair. How much did he pay for 2 pairs?

15. Nan bought a notebook for 49¢, a comb for 18¢, and a nail file for 9¢. How much did these things cost her altogether?

16. Joe's mother wanted some airmail stamps (6¢). If she gave Joe 75¢ to buy them, how many could he get for this amount?

UNIT 3

Living on a Ranch

America has many ranches where cattle and sheep and horses are raised. The cattle and sheep help feed the people in this country.

Do you live on a ranch? Have you ever visited one? Maybe when you are a little older, you will work on a ranch in the summer even though you live in the city. Can you think how you could help on a ranch if you are a girl? What would you do to help if you are a boy?

Sam and Dorothy live on a ranch. Dorothy has two pet lambs that she calls Spook and Curly. Sam raises his own calves and sheep. Sometimes he has to buy hay from his father to feed his calves when the snow is deep. How must Sam use numbers?

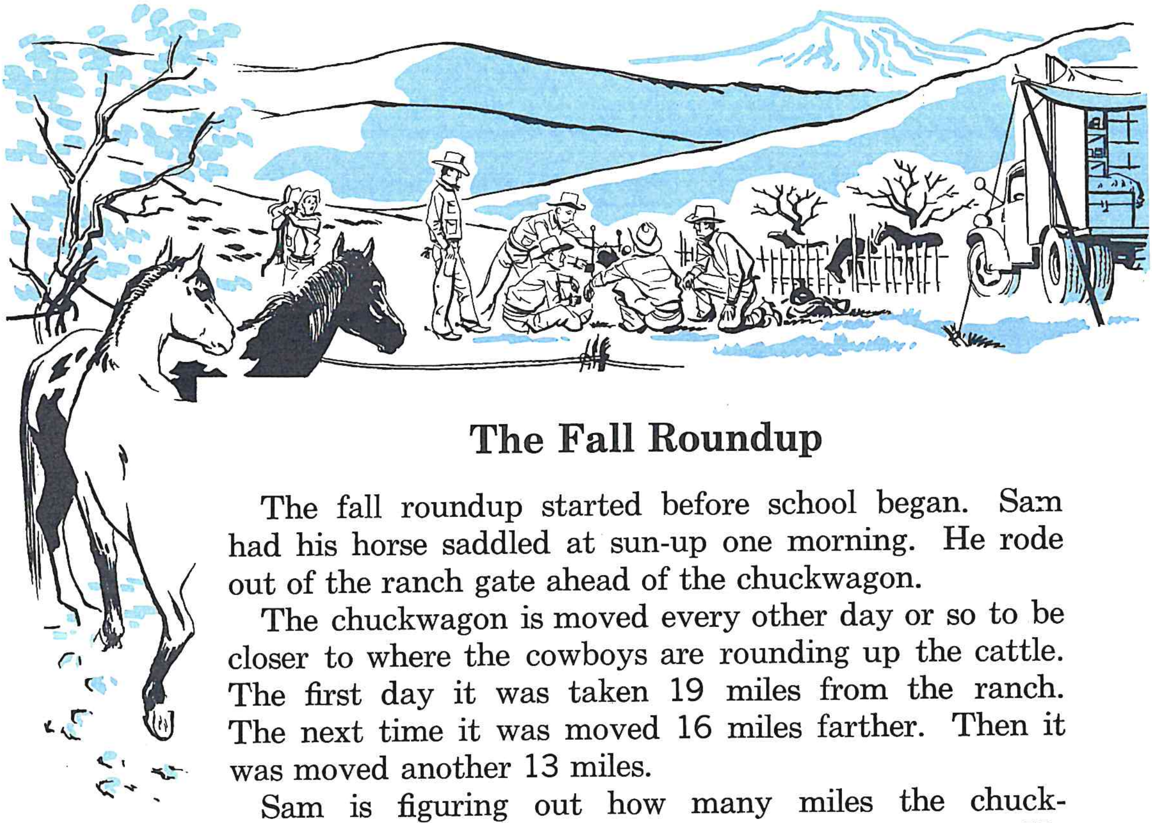
Sam and Dorothy see many wild animals every day. There are many deer on their ranch. Dorothy saw a large buck and two does just this morning. Their father killed a mountain lion last winter. He got a bounty for it. He took the pelt to the county courthouse, and the game warden gave him $50.00. The mountain lions sometimes kill the calves and sheep.

Sam and Dorothy would like to have an antelope for a pet, but they know they could never catch one. The antelope can run faster than a horse.

Sam and Dorothy do have a pet deer. Joe-Joe is his name. He is just beginning to get horns. He likes everything on the ranch but the sheep dogs. The sheep dogs are out with the herder most of the time, so they don't bark at Joe-Joe very much.

People who live on ranches have to know about numbers. Why will they need numbers if they sell sheep and cattle? How will they need numbers when they come into town to shop?

Do you want to go to the roundup? You can ride Pinto if you want to. He is a good cow pony. You will be glad the chuckwagon came along. You'll be hungry after riding all day.



The Fall Roundup

The fall roundup started before school began. Sam had his horse saddled at sun-up one morning. He rode out of the ranch gate ahead of the chuckwagon.

The chuckwagon is moved every other day or so to be closer to where the cowboys are rounding up the cattle. The first day it was taken 19 miles from the ranch. The next time it was moved 16 miles farther. Then it was moved another 13 miles.

Sam is figuring out how many miles the chuckwagon has been moved. Sam is adding 19, 16, and 13. He said, "I have 3 tens and 9 + 6 + 3, or 4 tens and 8 ones. The chuckwagon has gone 48 miles." How did Sam do the addition? Was it like this?

$$\begin{array}{r r l}
19 & & 1 \text{ ten and } 9 \text{ ones} \\
16 & = & 1 \text{ ten and } 6 \text{ ones} \\
\underline{+\ 13} & + & \underline{1 \text{ ten and } 3 \text{ ones}} \\
 & & 3 \text{ tens} + 18 \text{ ones} = \\
 & & \quad 4 \text{ tens and } 8 \text{ ones.}
\end{array}$$

How do you build a ten to get the 18 ones?

How many tens can you get from 18 ones? How many ones are left?

1. Add by writing tens and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
16	18	15	26	14	19	27	13	18	19
27	27	16	19	37	27	15	18	16	15
14	13	18	23	22	20	34	12	11	13

Working on the Roundup

The cowboys ride up into the foothills and mountains to bring all the cattle down. The cattle have a brand which tells who their owner is. Some of the calves that were born late in the spring are branded for the first time.

The cattle are sorted by their brand. All the cattle belonging to one ranch are driven toward that ranch.

Sam is keeping close count of those with his father's brand on them. The first day of the roundup they found 16 cattle belonging to his father. They found 29 the second and 24 the third day. How many did they find in the 3 days?

$$\begin{array}{r} 16 \\ 29 \\ +\,24 \\ \hline \end{array}$$

You build from 6 to a ten. 6 and how many are 10? You know 9 has parts of 4 and 5; so you think: 6 + 4 = 10; 10 and 5 = 15; 15 + 4 = 19. 19 = 1 ten and 9 ones. Write 9 in ones place in the answer, and hold the 1 ten for the tens column. Now add the tens, and write the sum in tens place in the answer. The answer is 69. (You will make fewer mistakes if you add the held tens last.)

1. Add by building a ten in the ones column:

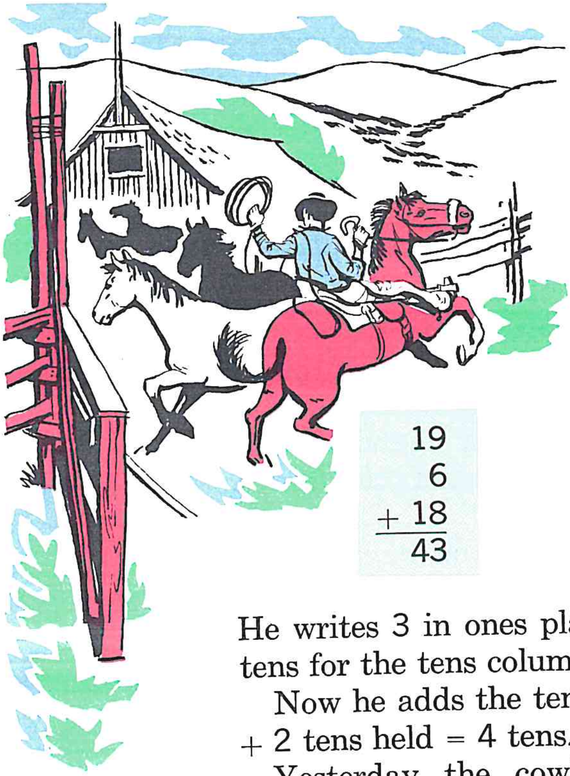
a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
26	34	28	15	16	39	40	37	24	17
19	29	49	29	29	49	19	19	36	28
22	13	12	14	12	11	30	11	19	42

2. Add downward. Check by adding upward:

27	18	39	47	15	16	13	15	27	38
18	28	18	38	18	18	27	37	17	17
11	13	12	10	14	10	11	12	10	13

3. The 2-T Ranch rounded up the cattle they had on Miller Hill. One rider brought in 29, another brought in 38, and a third rider brought in 12. Find how many cattle they rounded up altogether.

Practice—Building a Ten in Addition



Cow Ponies

Six of the ranches work together for the fall round-up work. Each ranch sends cowhands and cow ponies to round up all the cattle in that part of the range. Sam is counting the cow ponies.

$$\begin{array}{r} 19 \\ 6 \\ +\ 18 \\ \hline 43 \end{array}$$

Sam knows that $9 + 6 = 15$. Do you see that he is already in the teens (fifteen)?

He has 8 to add to 15. 15 and 5 are 20; 20 and 3 are 23. He writes 3 in ones place in the answer and holds the 2 tens for the tens columns.

Now he adds the tens. 1 ten + 1 ten = 2 tens; 2 tens + 2 tens held = 4 tens. There are 43 cow ponies. Why?

Yesterday the cowboys branded 19 calves in the morning and 27 in the afternoon. Today they branded 16 calves in the morning and 19 in the afternoon. How many calves have been branded altogether?

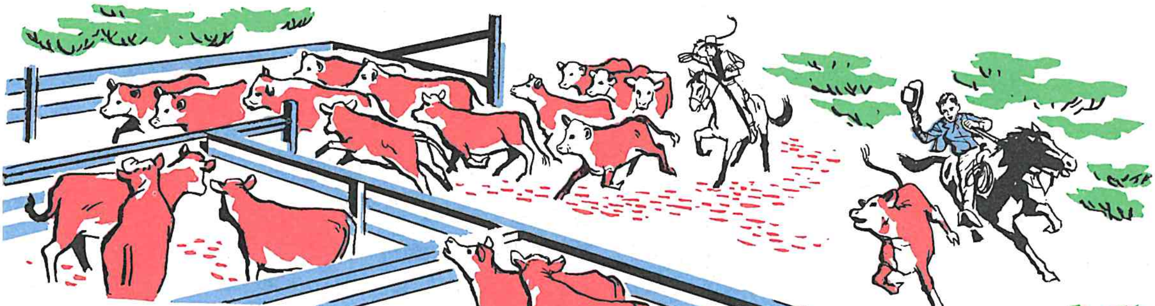
$$\begin{array}{r} 19 \\ 27 \\ 16 \\ +\ 19 \\ \hline 81 \end{array}$$

$9 + 7 = 16$; 16 and $4 = 20$, and $20 + 2 = 22$. $22 + 8 = 30$, and $30 + 1 = 31$. Write 1 in ones place in the answer. Hold the 3 tens.

Now, adding the tens, $1 + 2 + 1 + 1 + 3$ (held) $= 8$ tens. The cowboys branded 81 calves.

1. Add:

a.	b.	c.	d.	e.	f.	g.	h.	i.	j.
19	8	8	14	17	26	28	24	17	8
6	9	6	16	25	37	17	39	28	6
27	6	6	29	36	15	19	16	39	9
9	14	7	36	17	18	26	15	17	3



Cutting Out the Cattle for Shipping

Sam rides Pinto when he helps his father divide the cattle that he is going to send to market. Pinto can turn as fast as any cow, and he can run faster.

This morning Sam and his father put the cattle which they are sending to market in corrals. Sam added to find how many there were in the corrals.

Adding downward, 7 and 8 are 15. 15 + 9 = ? Use the parts 5 and 4 in 9 to build 2 tens or 20; 15 and 5 are 20. Then 20 and 4 are 24. Finally, 24 and 5 are 29.

$$\begin{array}{rl} 17 & \\ 28 & \\ 19 & (5+4) \\ +35 & \\ \hline 9 & \end{array}$$

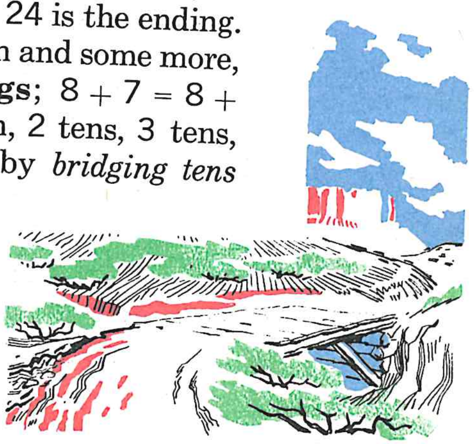
Look back to see what you did. You said 7 and 8 are 15, and the 9 made 20 and 4, or 24. Do you see that you went from a teens number to a twenty number?

$$10 \frown 20 \frown 30$$

When you do this, it is called **bridging**. The number you add to 20 is called the **ending**. The 4 in 24 is the ending.

When you add 8 and 7 by building a ten and some more, you are **adding by bridging and endings**; 8 + 7 = 8 + 2 + 5 = 10 + 5. So you can bridge a ten, 2 tens, 3 tens, etc. The process can be called adding by *bridging tens* or adding by bridging and endings.

Sam thinks it is just like going over the bridge on the way to the 2-T Ranch.



Addition—Bridging and Endings

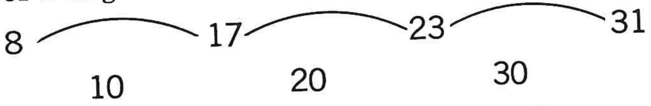
Practice in Adding by Bridging and Endings

8
9
6
8

8 and 9 are 17.

Do you see that we bridged from the ones (8) to the teens (17): What was the ending? Now we are at a danger point. We don't see 17, but we must remember it so we can add 6 to it. 17 and 6 = 23.

We don't see 23, but we must remember it and add 8 to it. 23 and 8 are 31. Do you see how the parts of 8 were used to get from 23 to 30, then bridged 30 with the ending of 1 to get 31? You bridge across a tens numbers:



1. Add downward, using bridging and endings:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
16	36	84	58	19	17	29	16	39
19	16	19	32	17	46	18	35	14
14	13	28	16	14	16	14	13	15

2. Before you have more practice in adding by bridging and endings, there are some additions which will help you. Practice these by saying the teens number and then the sum, like 17 and 3 are 20:

19	17	15	12	16	14	11	13	18
+ 1	+ 3	+ 5	+ 8	+ 4	+ 6	+ 9	+ 7	+ 2

3. Practice these by saying the 20-numbers and then the sums:

22	25	23	28	21	24	27	26	29
+ 8	+ 5	+ 7	+ 2	+ 9	+ 6	+ 3	+ 4	+ 1

4. Add downward:

14	29	38	14	45	37	19	18	36
29	36	25	20	27	19	16	27	16
18	15	19	16	18	16	37	16	18
28	17	16	19	26	18	15	14	18

The Last Step in Adding by Bridging and Endings

You have had practice in doing additions by building tens and then adding the endings. Now you should do the addition work at sight. For example, you should now be able to understand this:

25
+ 9
34

You know at sight that 9 + 5 in this addition will give you a ten to hold. You are bridging from a 20-number to a 30-number. Why? You also know that 9 + 5 ends in 4. Therefore your answer (sum) will be 34.

Now let's study an exercise that contains a "danger point," that is, where you have to hold a two-place number in your head.

18
26
+ 19

You know that 8 + 6 = 14. You have to remember the 14 and find 14 + 9.

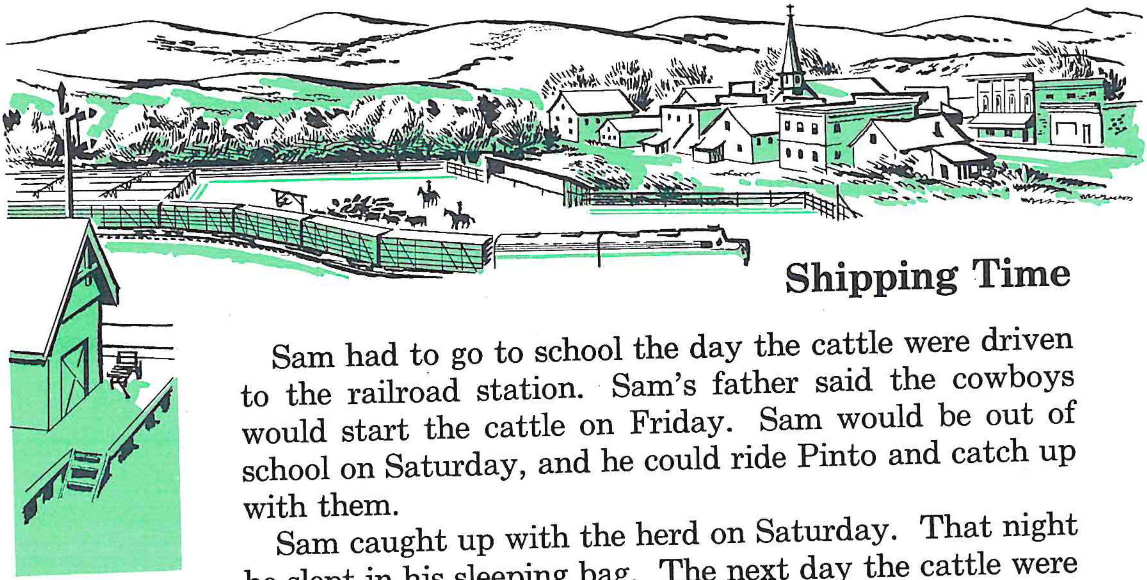
You see that the ones in 14 + 9 will give enough ones (4 + 9 = 13) to hold a ten and bridge from the teens number 14 to a 20-number. Then 4 + 9 has an ending of 3. This gives you 23 for the sum of the numbers in the ones column. Finish the exercise (add the tens).

1. Don't copy these exercises; practice giving the sums at sight:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
25	35	45	27	37	47	36	44	18	24
8	8	8	6	6	6	9	9	8	7
45	39	69	56	48	39	8	7	6	47
6	5	7	9	7	4	15	16	19	4

2. Add these, using the *last step* in the bridging and endings process:

26	15	37	16	45	21	38	43	25	9
39	26	29	26	37	15	47	6	17	10
25	38	18	28	19	33	16	11	42	34
					19	22	45	37	28



Shipping Time

Sam had to go to school the day the cattle were driven to the railroad station. Sam's father said the cowboys would start the cattle on Friday. Sam would be out of school on Saturday, and he could ride Pinto and catch up with them.

Sam caught up with the herd on Saturday. That night he slept in his sleeping bag. The next day the cattle were loaded into the freight cars.

1. Sam watched the cattle being loaded. The first freight car took 30 cattle; the second, 31; the third, 32; and the next one, 30. How many cattle were put in these 4 cars?

2. Sam's father got 45 yearling calves into one freight car, 30 cows into the next car, and 32 cows into another car. Find the number of cows and calves in these freight cars.

3. A long freight train went past as the cattle were being loaded on a side track. Sam counted 2 engines, 8 coal cars, 24 cattle cars, 16 refrigeration cars, 27 box cars loaded with sugar beets, 12 box cars loaded with lumber, and 1 caboose. How many cars did this freight train have?

4. The last of the cattle were loaded into 4 cars. They put 30 in the first car, 31 in the second car, and 32 in each of the last 2 cars. Find the number of cattle in these 4 cars.

5. How many cattle did Sam's father ship in all eight cars (Problems 1 and 4)?

Story Problems

Work and Play on a Ranch

1. Sam helps put up the hay. They put 16 loads in a stack the first day, 19 loads the next day, and 17 loads today. How many loads of hay is this in all?

2. Sam's father put the alfalfa in bales. Sam counted 35 bales in one alfalfa patch, 38 bales in another, and 46 bales in the patch along the creek. Find the number of bales in all.

3. Sam and his sister "ride the fence," looking for places where the fences need to be fixed. The first day they rode 6 miles, the next day 8 miles, the third day 9 miles, and 7 miles today. How many miles did they ride in the 4 days?

4. That night Sam and Dorothy took the nails and brads out of their pockets. Sam had 6 nails in one pocket and 8 in the other; he had 5 brads in one pocket and 4 in the other. How many nails and brads together did he have?

5. Pat, one of the cowboys, played a trick on Sam. He hid his boots. Sam's father said Sam could ride into town with him if he was ready in a half-hour. Sam spent 5 minutes looking for his boots in the barn, 8 minutes in the bunk house, 9 minutes in the tool shed, and 6 minutes in the sheep shed. This is where he found them. Did Sam find them in time to go into town with his father?

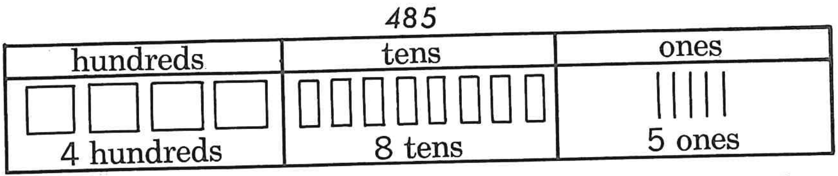
6. Add; do not copy the problems. Use scratch paper for your answers:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**	**k.**
24	13	36	49	17	28	27	18	13	28	15
39	50	18	10	48	12	16	7	29	17	29
18	29	17	28	26	37	19	39	16	34	15
16	15	14	7	16	19	13	14	17	15	18

Sam and His Father Count the Cattle on the Winter Range

Sam's father must know how many cattle he has on the winter range to be sure he has enough feed for them through the long winter. Sam found that there were 485.

Let's study this number 485. You know that the 5 is in ones place, and the 8 is in tens place. But what is the name of the place that is held by the 4? You call the place on the left of tens by the name of *hundreds*. Do you know why? This is the picture when counters are used.



What is the meaning of hundreds? You know that 10 ones equal 1 ten. Also, you know by counting that one more than ninety-nine gives a hundred. So, 99 + 1 = 9 tens + 9 ones + 1 one = 9 tens + 10 ones = 10 tens. Then, instead of using 10 tens, you change them to the value of 1 hundred and put a 1 in the place on the left of tens.

a bundle of 10 ones = 1 ten
a bundle of 10 tens = 1 hundred

You should now make some bundles of hundreds counters and some bundles of 10 tens counters to go with your old bundles of 10 ones.

How many ones in a hundred?

How would you write the number that shows no ones, no tens, but has a 1 in hundreds place? Is it 100?

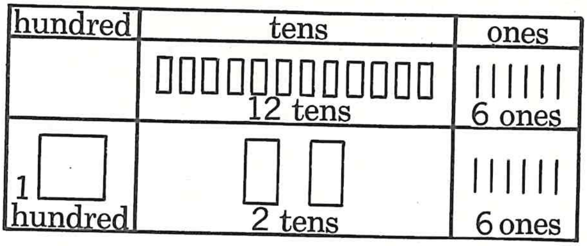
Does 100 mean a hundred ones? Why?

Does 100 mean 10 tens? Why?

Why does 485 mean that you have 4 hundreds, 8 tens, and 5 ones?

Studying Three-Place Numbers

Look at this box. How can you make 1 hundred and 2 tens out of 12 tens? Try this with your tens counters. Does it work?



1. Use 15 tens counters. How many of them would you use to make 100? How many tens are left?

2. How can there be 42 ones in the number 242?

3. Tell how the 3 hundreds in 315 could have come from a group of 31 tens.

4. What is the greatest number of ones that you could find in 159? the greatest number of tens?

5. Show or tell how you know that 140 ones is the same as 14 tens.

6. Show with counters that 140 is 1 hundred, 4 tens, and 0 ones.

7. Explain how $4.75 is a three-place number in hundreds, tens, and ones.

8. If you use different pieces of money to tell the value of the places in $3.68, how do you find each of the following?

a. $3.68 = 2 dollars, 16 dimes and 8 cents
b. $3.68 = 3 dollars, 5 dimes and 18 cents
c. $3.68 = 1 dollar, 26 dimes and 8 cents
d. $3.68 = 36 dimes and 8 cents

9. Tell how you could have 1 hundred, 13 tens, and 6 ones in the number 236.

10. Could you use 245 as 2 hundreds and 45 ones? Tell how you get these parts.

11. Tell why the following are correct:

a. 298 = 28 tens + 18 ones
b. 345 = 2 hundreds + 14 tens + 5 ones
c. 467 = 3 hundreds + 15 tens + 17 ones

Reading and Writing Three-Place Numbers

We read 264 as two hundred sixty-four (we do not say two hundred and sixty-four). If you do not say all the places, it means that you are reading the number as ones.

1. Read, and tell what each figure stands for in these numbers:

372 275 315 400
186 107 260 143
426 278 381 704
217 936 406 382
539 921 390 521

2. When Miss Jones said, "Write the number three hundred eight," Mary wrote it this way: 308.

The zero in 308 means there are no tens in tens place. The places in the number are three hundreds, not any tens, and eight ones.

Read these numbers. Tell what the 0 in each number means: 109 120 403 609 380 100

3. Tell what the zero means in 170; in 401.

4. Tell what the 3 means in each of these numbers (what place is it in?).

234 163 386 135 329 503 333

	hundreds	tens	ones
406 =	4	0	6

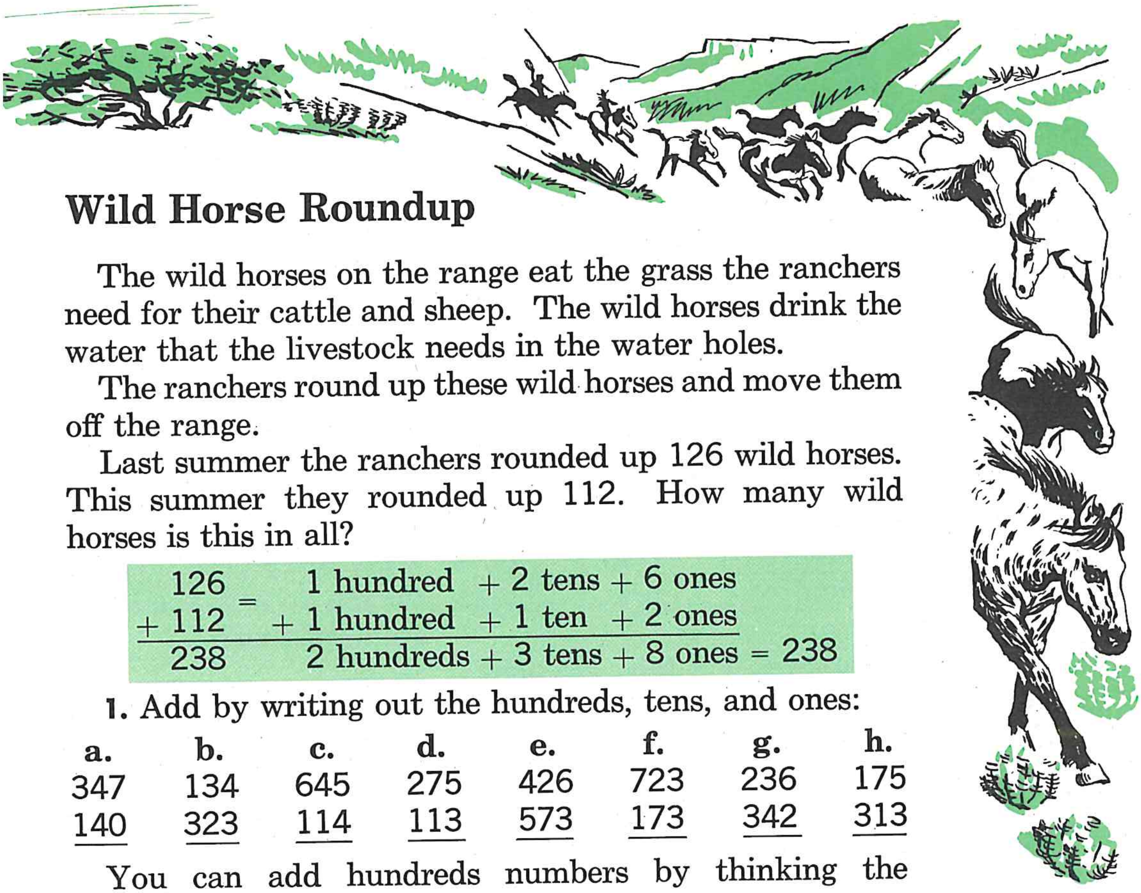
5. Make a box like this, and put the figures of the numbers 312, 642, 170, 401, and 915 in their right places.

6. Write these amounts in numbers:

a. four hundred sixty-seven
b. five hundred seventy
c. one hundred nine
d. nine hundred forty-eight
e. six hundred sixteen
f. two hundred six
g. three hundred twenty-one
h. four hundred thirty

7. Answer these:

439 means ? hundreds ? tens ? ones
203 means ? hundreds ? tens ? ones
930 means ? hundreds ? tens ? ones



Wild Horse Roundup

The wild horses on the range eat the grass the ranchers need for their cattle and sheep. The wild horses drink the water that the livestock needs in the water holes.

The ranchers round up these wild horses and move them off the range.

Last summer the ranchers rounded up 126 wild horses. This summer they rounded up 112. How many wild horses is this in all?

$$\begin{array}{r l}
126 & = 1 \text{ hundred} + 2 \text{ tens} + 6 \text{ ones} \\
+\,112 & \;\;\, + 1 \text{ hundred} + 1 \text{ ten} + 2 \text{ ones} \\
\hline
238 & \;\;\;\;\, 2 \text{ hundreds} + 3 \text{ tens} + 8 \text{ ones} = 238
\end{array}$$

1. Add by writing out the hundreds, tens, and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
347	134	645	275	426	723	236	175
140	323	114	113	573	173	342	313

You can add hundreds numbers by thinking the hundreds, tens, and ones.

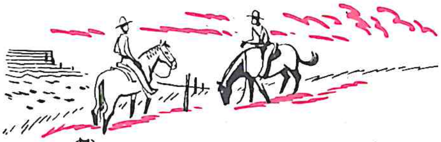
$$\begin{array}{r}
265 \\
+\,332 \\
\hline
597
\end{array}$$

Add the ones: 5 + 2 = 7 ones.
Add the tens: 6 + 3 = 9 tens.
Add the hundreds: 2 + 3 = 5 hundreds.
The answer is read five hundred ninety-seven.

2. Add by thinking the hundreds, tens, and ones:

327	523	421	685	523	457	345	652
361	126	473	114	446	322	234	133

3. Sam's father helped round up wild horses twice this summer. He decided he had ridden a total of 102 miles by jeep and horseback on the first trip, and about 96 miles on the second trip. How far did he travel on the two trips?



Friends Meet On the Range

Sam and his father are seeing how much water is left in the water holes and creeks. They want to be sure that there is enough to last the cattle until the fall rains come.

They met Chris Clark and his father, who owns the 2-T Ranch. The Clarks have been out counting their cattle. They had 264 cattle on the range, and 179 were brought down from the mountains. How many cattle do they have altogether?

$$\begin{array}{r} 264 \\ +\,179 \\ \hline \end{array} = \begin{array}{r} 2 \text{ hundred} + 6 \text{ tens} + 4 \text{ ones} \\ +\,1 \text{ hundred} + 7 \text{ tens} + 9 \text{ ones} \\ \hline 3 \text{ hundred} + 13 \text{ tens} + 13 \text{ ones} \\ \text{or} \\ 4 \text{ hundred} + 4 \text{ tens} + 3 \text{ ones} \end{array}$$

How many tens are there in 13 ones? What do you do with the 1 ten from 13 ones?

6 tens and 7 tens are 13 tens. Add the ten you held from 13 ones. How many do you have? How many hundreds are there in 14 tens? Finish the addition.

Now try adding without writing the names of the places of the hundreds, tens, and ones. *Think* the facts as you add:

$$\begin{array}{r} 264 \\ +\,179 \\ \hline 3 \end{array}$$

$$\begin{array}{r} 264 \\ +\,179 \\ \hline 443 \end{array}$$

Add the ones: 4 and 9 are 13, or 1 ten and 3 ones. Write the 3 in ones place in the answer, and hold the 1 ten. Now add the tens. Add the ten you held to the numbers in the tens column: 6 + 7 + 1 (held) = 14 tens. 14 tens = 1 hundred and 4 tens. Write 4 in tens place in the answer. Hold the hundred. Now add the hundreds. Add the hundred you held to the numbers in the hundreds column: 2 + 1 + 1 (held) = 4 hundreds. Write 4 in the hundreds place in the answer.

1. Add:

186	367	427	359	108	355	106	127
259	205	198	109	265	295	406	543

Using Bridging and Endings with Hundreds

Sometimes you find problems where it is necessary to add more than two of the three-place numbers. You know that this could include the addition of columns where you might need to bridge a 20 or perhaps a 30. Are you able to add by seeing the ending and knowing what tens you must bridge, or must you build the tens and then add the ending to do the bridging? Let's try an example of each.

Building tens in bridging:

$$\begin{array}{r} 166 \\ 298 \\ +\ 469 \\ \hline 3 \end{array}$$

Add the ones:

6 + 8 = 6 + 4 + 4 = 10 + ending of 4 = 14.

14 + 9 = 14 + 6 + 3 = 20 + ending of 3 = 23, or 2 tens + 3 ones. Write 3 in ones place in the answer, and hold the 2 tens.

$$\begin{array}{r} 166 \\ 298 \\ +\ 469 \\ \hline 33 \end{array}$$

Add the tens:

6 + 9 = 6 + 4 + 5 = 10 + ending of 5 = 15.

15 + 6 = 15 + 5 + 1 = 20 + ending of 1 = 21.

Write 3 in tens place in the answer, and hold the 2 hundreds.

$$\begin{array}{r} 166 \\ 298 \\ +\ 469 \\ \hline 933 \end{array}$$

Add the hundreds:

1 + 2 + 4 + 2 (held) = 9.

Write 9 in hundreds place in the answer.

Seeing endings in the bridging:

$$\begin{array}{r} 166 \\ 298 \\ +\ 469 \\ \hline \end{array}$$

Add the ones:

6 + 8 ends in 4 and bridges a ten. 6 + 8 = 14.

14 + 9 ends in 3 and bridges 20 or 2 tens. 14 + 9 = 23.

Write the ending of 3 in ones place, and hold 2 tens.

You should finish the addition.

1. Add:

a.	b.	c.	d.	e.	f.	g.	h.
246	589	242	266	716	147	188	625
287	161	119	348	89	364	348	137
235	237	497	299	148	228	167	148

Practice in Adding Hundreds

1.
$$\begin{array}{r} 175 \\ 279 \\ 167 \\ +\ 238 \\ \hline 859 \end{array}$$

a. What tens must you bridge in adding the ones?

b. What endings did you have when you bridged the different tens?

c. The sum of the ones is 29. What do you do with the 2 tens in 29?

d. Do you know how 25 tens must be used?

Add (build tens and add endings):

	a.	b.	c.	d.	e.	f.	g.	h.	i.
2.	246 123 326	209 418 106	543 148 143	167 213 386	162 137 456	583 146 146	186 126 146	402 179 101	321 119 124
3.	120 321 422	308 555 110	675 101 210	432 390 111	408 433 78	127 360 107	352 110 477	444 142 202	207 300 452
4.	159 8 22	408 72 190	333 120 7	221 33 9	55 140 7	420 9 46	113 22 4	204 113 3	76 456 12

Add (see the bridged tens and the endings):

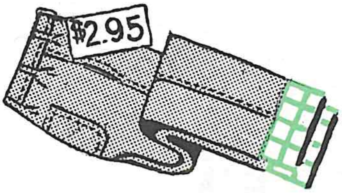
5.	169 157 233	157 155 258	113 260 196	299 189 116	140 180 195	189 395 128	126 139 145	380 164 179	219 177 165
6.	367 40 133	786 90 4	389 99 50	666 36 120	156 28 86	785 16 50	345 8 62	890 45 7	368 19 101

Add:

7.	159 367 182 124	204 109 506 166	362 174 298 138	179 183 177 149	158 179 286 126	273 249 168 147	189 257 196 138	179 157 186 129	123 319 177 146

Shopping at the Country Store for Winter Clothes

Winter is on its way. There is some snow on the tops of the mountains north of the ranch. Sam and his sister Dorothy must have some new winter clothes. They can buy some of their clothes at the country store.



1. Sam's father bought a pair of new jeans for him. They cost $2.95.

a. Write the cost of the jeans in dollars, dimes, and pennies.

b. Tell why $2.95 is a three-place number.

2. Sam will need warm shirts for winter. His father bought him a flannel shirt and a wool shirt.

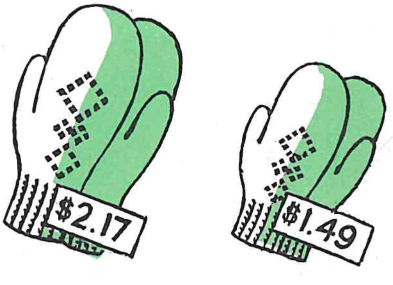
$$\begin{array}{r} \$6.95 \\ + \$2.78 \\ \hline \end{array}$$

a. How much did both of these shirts cost?

Add the ones first. The ones in this problem are the cents. What do you do with 13¢?

Now add the tens (dimes). Add the dime you held from the ones column last. There are ? dimes. How many tens do you write in the tens column?

Now add the dollars.



3. Dorothy and her mother each bought a pair of wool mittens just alike. How much did both pairs cost?

4. Write 17 dimes as a three-place number.

Money As a Three-Place Number; Adding Money Values

The Mail Order Catalogue

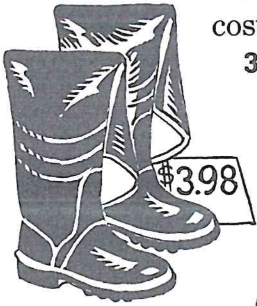
It is a big day; the mail order catalogue has come. It is thick with pages showing everything that you can buy.

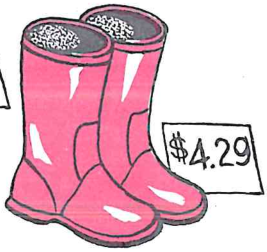
1. Dorothy wanted to look at the clothes, but Sam wanted to look at the lariats and knives. Dorothy is pretty good at roping too, so they both chose this lariat. Did they make the order out correctly?

ORDER SHEET

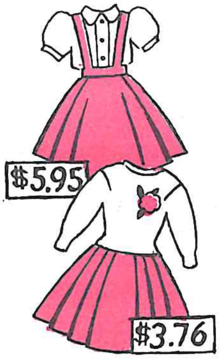
QUANTITY	NAME OF ARTICLE	COST OF EACH	TOTAL
2	Lariat	$2.45	

2. Sam is sending for a hunting knife, so he can skin rabbits. He is spending all the money he has saved for this knife and a new pair of cowhide gloves. How much will both the knife ($5.90) and the pair of gloves ($2.65) cost?





3. The snow may be deep this year and both Sam and Dorothy need a new pair of rubber boots. This is the kind they are buying this year. Find the cost of 2 pairs of boots.



4. Dorothy and her mother have decided to buy these dresses for Dorothy to wear to school. Find the cost of the 2 dresses.

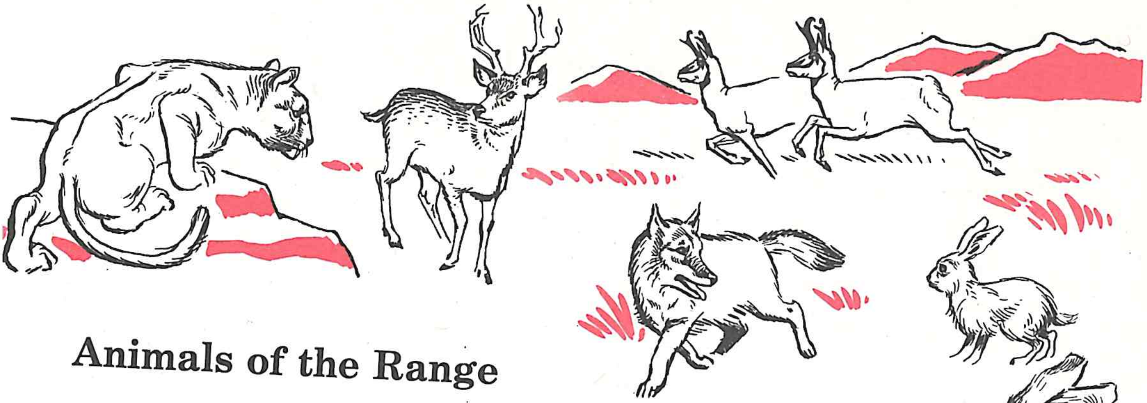
5. Change these to better answers:

a. 3 dollars, 19 dimes, 5 cents = ? dollars, ? dimes, ? cents = $? .

b. 1 dollar, 13 dimes, 11 cents = ? dollars, ? dimes, ? cents = $? .

6. Add:

a.	b.	c.	d.	e.	f.	g.
425	826	395	467	831	455	267
545	36	17	139	25	167	135
17	9	498	26	8	348	236



Animals of the Range

1. Sam and his father track deer in the first snow in the fall. They saw 4 deer along Meek Creek, a doe and 2 fawns on Miller Hill, and 5 deer at the head of Deer Creek. How many deer did they see altogether?

2. Dorothy saw a herd of 14 antelope on the way to school. Sam saw 18 on the other side of the hill. They saw 15 on the way home from school. How many antelope did they see in all?

3. Sam sees lots of jackrabbits when he doesn't have his .22 rifle with him. Today he saw 5 down by the cottonwoods, 7 along Deer Creek, 9 on the flats, and 3 by the haystacks. Find the number he saw in all.

4. One of the cowboys saw a mountain lion in Dale Canyon. He followed it up the canyon and killed it and its mate. The bounty on a mountain lion is $50.00. How much should he be paid in bounty?

5. Sam and his father kill every coyote they can. They get a bounty of $7.00 for every one they kill. Last winter they killed 6 coyotes and 1 mountain lion. How much did they make in bounties?

6. Add:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
165	247	129	128	120	408	132	189	276
158	165	158	95	80	157	88	195	147
196	296	376	270	155	96	137	266	184
319	165	163	7	134	50	178	168	78

Lambing Time

April is the month when most lambs are born. The sheepherders and Sam's father work long hours caring for the new-born lambs. Sometimes a spring snowstorm kills some of the tiny lambs. Twenty-five lambs were born yesterday. Four of them were lost. How many lambs are left?

$$\begin{array}{r} 25 \\ -\ 4 \\ \hline 21 \end{array} = \begin{array}{lr} \square\square & ||||| \\ - & |||| \\ \hline ? & ? \end{array} = \begin{array}{r} \text{2 tens and 5 ones} \\ -\qquad\qquad \text{4 ones} \\ \hline \text{2 tens and 1 one} \end{array} = 21$$

Prove this is true by using your counters.

Sam is helping his father get some of the ewes and lambs into the barn. There are 22 ewes and lambs that they want to put in the barn. Nine are still outside. How many are in the barn?

$$\begin{array}{r} 22 \\ -\ 9 \\ \hline \end{array} = \begin{array}{lr} \square\square & || \\ - & ||||||||| \\ \hline \end{array} = \begin{array}{r} \text{2 tens and 2 ones} \\ -\qquad\qquad \text{9 ones} \\ \hline \end{array}$$

$$\begin{array}{r} 22 \\ -\ 9 \\ \hline 13 \end{array}$$

Nine ones from 12 ones leaves 3 ones. Write 3 in ones place in the answer. You used 1 ten, so you have only 1 ten left. Write 1 in tens place.

1. Subtract, writing the tens and ones:

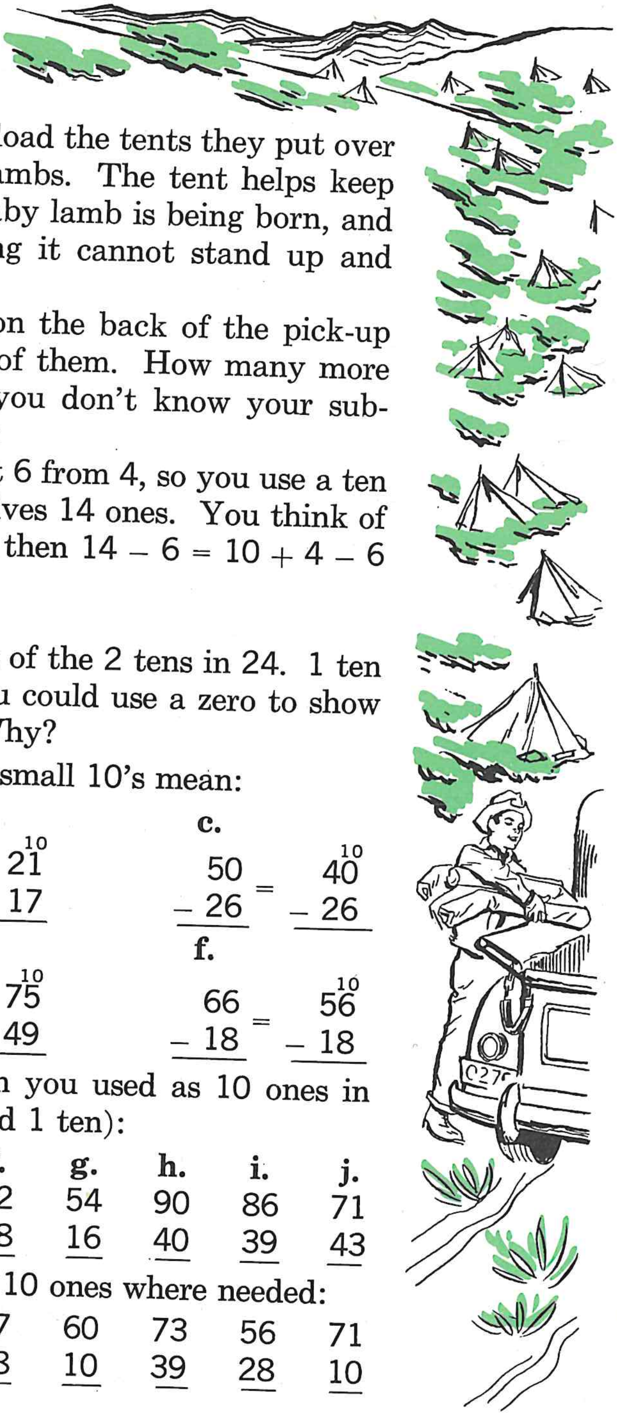
$$\begin{array}{r} 48 \\ -\ 29 \\ \hline \end{array} = \begin{array}{r} \text{4 tens and 8 ones} \\ -\ \text{2 tens and 9 ones} \\ \hline \end{array} = \begin{array}{r} \text{3 tens and 18 ones} \\ -\ \text{2 tens and \ 9 ones} \\ \hline \text{1 ten \ and \ 9 ones} \end{array} = \ ?$$

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i**	**j**
49	68	57	46	55	78	99	88	69	37
24	35	23	22	23	26	25	34	16	13

2. Subtract, without writing the tens and ones:

93	81	75	46	63	52	53	51	80	35
46	25	19	18	29	19	28	16	36	18

Woolly White Lambs



Sam is helping his father unload the tents they put over the mother sheep and their lambs. The tent helps keep out the cold wind while the baby lamb is being born, and during the time it is so young it cannot stand up and move about.

There are 24 tents loaded on the back of the pick-up truck. Sam has unloaded 16 of them. How many more does he have to unload? If you don't know your subtraction facts, you can do this:

$\begin{array}{r}24\\-16\\\hline\end{array}$ You cannot subtract 6 from 4, so you use a ten for more ones. This gives 14 ones. You think of 14 ones as 10 and 4; then $14 - 6 = 10 + 4 - 6$ or $\begin{array}{r}10+4\\-6\\\hline\end{array} = 8$. Why?

Now, you have 1 ten left out of the 2 tens in 24. 1 ten from 1 ten leaves no tens. You could use a zero to show this, but it is not necessary. Why?

1. Subtract, telling what the small 10's mean:

a. $\begin{array}{r}67\\-19\\\hline\end{array} = \begin{array}{r}5\overset{10}{7}\\-19\\\hline\end{array}$ **b.** $\begin{array}{r}31\\-17\\\hline\end{array} = \begin{array}{r}2\overset{10}{1}\\-17\\\hline\end{array}$ **c.** $\begin{array}{r}50\\-26\\\hline\end{array} = \begin{array}{r}4\overset{10}{0}\\-26\\\hline\end{array}$

d. $\begin{array}{r}72\\-16\\\hline\end{array} = \begin{array}{r}6\overset{10}{2}\\-16\\\hline\end{array}$ **e.** $\begin{array}{r}85\\-49\\\hline\end{array} = \begin{array}{r}7\overset{10}{5}\\-49\\\hline\end{array}$ **f.** $\begin{array}{r}66\\-18\\\hline\end{array} = \begin{array}{r}5\overset{10}{6}\\-18\\\hline\end{array}$

2. Subtract, writing the 1 ten you used as 10 ones in ones place (don't forget you used 1 ten):

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
83	57	64	90	75	62	54	90	86	71
40	29	38	64	36	18	16	40	39	43

3. Subtract, thinking parts of 10 ones where needed:

75	92	68	80	72	57	60	73	56	71
20	45	19	18	36	28	10	39	28	10

Practice in Subtraction

You should know all of the subtraction facts. Try these to see if you know them at sight:

	a.	b.	c.	d.	e.	f.	g.	h.	i.
1.	9 9	17 8	9 7	10 1	8 6	14 5	6 4	3 3	11 8
2.	17 8	10 9	8 7	6 6	13 5	7 4	4 3	10 8	15 6
3.	7 7	11 9	4 4	5 3	3 2	9 8	14 6	8 4	10 6
4.	12 4	6 5	8 1	12 9	2 2	8 8	13 7	10 4	8 2
5.	15 7	9 6	7 5	11 7	13 9	5 4	4 2	1 1	13 6
6.	9 2	11 2	6 3	12 8	7 1	14 9	12 7	9 2	5 2
7.	12 5	11 4	13 8	11 6	16 7	9 5	15 9	8 3	12 6
8.	7 3	14 8	11 5	9 4	12 3	6 2	2 1	16 9	10 3

Subtract:

	a.	b.	c.	d.	e.	f.	g.	h.
9.	93 46	81 25	75 19	47 18	63 29	52 19	43 28	60 40
10.	51 16	80 36	57 30	90 42	37 10	70 23	63 53	80 64

Black Lambs and White Ones

More lambs are born every day. Twenty-four lambs have been born so far this week. Five of them are black, and the rest are white. How many white lambs have been born?

Sam could use either of two ways to find the answer.

Using subtraction facts:

$$\begin{array}{r} 24 \\ -\ 5 \\ \hline 19 \end{array}$$

5 ones from 14 ones = 9 ones. (Why 14 ones?)
He has 1 ten out of the 2 tens left. Why?
19 lambs are white.

Using addition facts:

$$\begin{array}{r} 24 \\ -\ 5 \\ \hline \end{array}$$

5 ones and how many ones = 14 ones?
Why does he use 14 ones instead of 4 ones?
What should he subtract in tens place?
0 tens and how many tens = 1 ten? Why?
The answer is ? tens and ? ones = ?.

1. Take 9 from 15 by thinking: How many more? You can think: 9 and how many more are 15? You know that 9 and 6 are 15. Or, you can think: 9 and 1 are 10; 10 and 5 are 15. You have added 1 and 5 to 9. Since 5 + 1 are 6, the difference is 6.

$$\begin{array}{r} 15 \\ -\ 9 \\ \hline 6 \end{array}$$

2. 8 and how many more are 17? Write the answer in ones place. How many tens do you have left when you have used 1 of the 5 tens? 2 and how many more are 4 tens? Checking:

If the whole is 57, and 28 and 29 are the parts, then add the parts to see if you get the whole.

$$\begin{array}{r} 57 \\ -\ 28 \\ \hline 29 \end{array} \qquad \begin{array}{r} 28 \\ +\ 29 \\ \hline ? \end{array}$$

3. Subtract by thinking how many more (check each answer):

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
66	87	73	60	53	44	32	80	79
34	25	40	40	29	25	17	29	13

4. Subtract by thinking the subtraction facts:

75	84	73	95	29	24	13	74	63
38	57	29	27	9	18	7	26	58

Gumdrops for Pat

Pat is working long hours now during lambing time. Sam decided to do something for Pat.

Sam knows Pat likes gumdrops; so he bought some the last time he was in town.

Sam bought a pound of gumdrops for 36 cents. He gave the clerk 50¢. The clerk counted the change as he gave it to Sam: "36¢, 37¢, 38¢, 39¢, 40¢, 50¢."

Sam thought to himself, "That is just like thinking how many more in subtraction." Then he subtracted it to be sure he had received the right change:

$$\begin{array}{r} 50\text{¢} \\ -\ 36\text{¢} \\ \hline 14\text{¢} \end{array}$$

6 ones and 4 more ones are 10 ones. Why?
3 tens and 1 ten are 4 tens. Why?

Sam had a dime and 4 pennies left. Then he saw a chocolate bar. It cost 6¢. Sam gave the clerk his dime. This is the change he received: "6¢ is what you paid, 7¢, 8¢, 9¢, 10¢." Subtract to be sure that this is right:

10¢ − 6¢ = 4¢. Think: 6 and 4 = 10; 4¢ change.

1. Count the change in these, then subtract to be sure you are right:

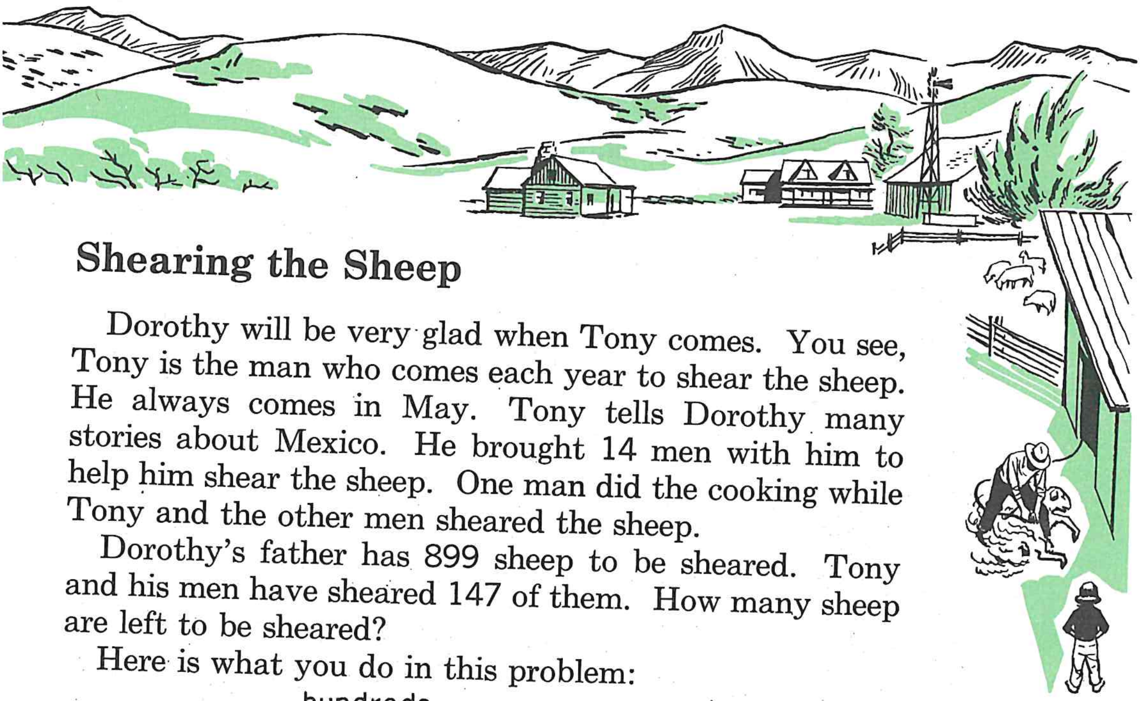
a. You buy a box of candy for 67¢. You give the clerk three quarters.

b. You buy a box of cheese for 83¢. You give the clerk a half-dollar, a quarter, and two nickels.

c. You buy a bag of candy for 58¢. You give the clerk three quarters. Tell three different ways in which the clerk could give you the correct change.

2. Subtract:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
64	46	75	34	42	64	36	85	62
18	29	69	29	29	29	18	27	48

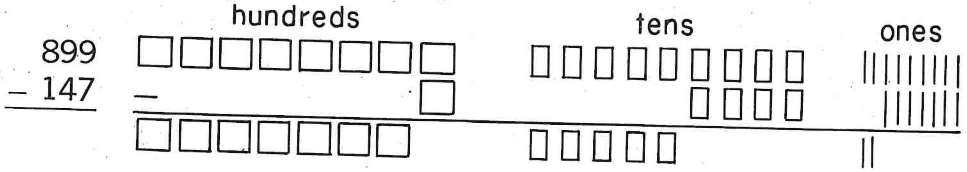


Shearing the Sheep

Dorothy will be very glad when Tony comes. You see, Tony is the man who comes each year to shear the sheep. He always comes in May. Tony tells Dorothy many stories about Mexico. He brought 14 men with him to help him shear the sheep. One man did the cooking while Tony and the other men sheared the sheep.

Dorothy's father has 899 sheep to be sheared. Tony and his men have sheared 147 of them. How many sheep are left to be sheared?

Here is what you do in this problem:



Subtract, writing the hundreds, tens, and ones:

$$\begin{array}{r} 899 \\ -\ 147 \\ \hline \end{array} = \begin{array}{l} 8 \text{ hundreds and } 9 \text{ tens and } 9 \text{ ones} \\ -\ 1 \text{ hundred and } 4 \text{ tens and } 7 \text{ ones} \\ \hline 7 \text{ hundreds and } 5 \text{ tens and } 2 \text{ ones} \end{array} = ?$$

1. Subtract, writing the hundreds, tens, and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
786	959	780	871	487	995	878	679	788
146	145	330	550	151	444	347	236	542

2. Subtract:

986	781	980	471	453	782	593	475	677
128	337	445	146	124	348	155	148	239

Different Ways to Subtract

There are different ways to think of place values when subtracting hundreds. Study this exercise:

$$\begin{array}{r} 412 \\ -\ 168 \\ \hline \end{array} = \begin{array}{r} \text{4 hundreds and 1 ten and 2 ones} \\ -\ \text{1 hundred and 6 tens and 8 ones} \\ \hline \end{array}$$

Using the place values:

$$\begin{array}{r} 412 \\ -\ 168 \\ \hline \end{array} = \begin{array}{r} \text{4 hundreds and 0 tens and 12 ones} \\ -\ \text{1 hundred and 6 tens and 8 ones} \\ \hline \end{array}$$

This gives enough ones, so you can subtract the ones. 12 ones – 8 ones = 4 ones.

Now you must have some tens. So:

$$\begin{array}{r} 412 \\ -\ 168 \\ \hline \end{array} = \begin{array}{rcrcr} \text{3 hundreds} & \text{and} & \text{10 tens} & \text{and} & \text{12 ones} \\ -\ \text{1 hundred} & \text{and} & \text{6 tens} & \text{and} & \text{8 ones} \\ \hline ? & \text{and} & ? & \text{and} & ? \end{array} = ?$$

Finish the subtraction.

Another way to think the values:

$$\begin{array}{r} 412 \\ -\ 168 \\ \hline \end{array} = \begin{array}{r} \text{41 tens and 2 ones} \\ -\ \text{16 tens and 8 ones} \\ \hline \end{array} = \begin{array}{r} \text{40 tens and 12 ones} \\ -\ \text{16 tens and 8 ones} \\ \hline \end{array}$$

What has been done to the 4 hundreds, 1 ten, and 2 ones?

12 ones – 8 ones = 4 ones

40 tens – 16 tens can be subtracted like any two-place number: 40 – 16 = 24 (tens). Why?

So you have 24 tens and 4 ones, or 2 hundreds, 4 tens, and 4 ones = 244.

You can think also that the 40 tens – 16 tens equal:

$$\begin{array}{rcr} \text{3 hundreds} & \text{and} & \text{10 tens} \\ -\ \text{1 hundred} & \text{and} & \text{6 tens} \\ \hline \text{2 hundreds} & \text{and} & \text{4 tens} \end{array}$$

1. Subtract by using 1 ten to give enough ones, then using a hundred to give enough tens:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
923	841	612	533	757	816	713	542	624	777
177	356	247	355	179	558	366	188	599	389

Thinking "How Many More" in Subtracting Hundreds

This is how to use *how many more* when you are subtracting hundreds:

$$\begin{array}{r} 584 \\ -\,359 \\ \hline \end{array}$$

You cannot take 9 ones from 4 ones. Use a ten. This gives you 14 ones (with the 4 you already have). Now think: 9 and how many more are 14? If you know your addition facts, you will know that 9 and 5 are 14. Write 5 in ones place in the answer. Now subtract the tens. You used 1 ten, so you have 7 tens left. 5 and how many more are 7? Write this number in tens place in the answer.

Subtract the hundreds. 3 and how many more are 5? Write this in hundreds place in the answer.

1. Subtract, thinking how many more you need:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
842	666	382	563	462	899	131	450	128	476
387	457	404	145	146	145	67	288	65	132

2. Watch the zeros in subtraction. Explain both exercises **a** and **b** below:

a. $\begin{array}{r} 405 \\ -\,136 \\ \hline \end{array}$ $\quad \begin{array}{r} \overset{3}{\cancel{4}}\overset{10}{0}5 \\ -\,136 \\ \hline \end{array}$ $\quad \begin{array}{r} 39\overset{10}{5} \\ -\,136 \\ \hline 269 \end{array}$

6 ones from 15 ones = 9 ones
3 tens from 9 tens = 6 tens
1 hundred from 3 hundreds = 2 hundreds

b. $\begin{array}{r} 405 \\ -\,136 \\ \hline \end{array} = \begin{array}{r} \text{40 tens and 5 ones} \\ -\ \text{13 tens and 6 ones} \\ \hline \end{array} = \begin{array}{r} 405 \\ -\,136 \\ \hline 269 \end{array}$

3. First subtract as hundreds, tens, and ones; then check by subtracting as tens and ones:

506	802	202	505	703	604	401	406	905	420
229	439	137	308	450	183	260	267	446	216

4. $\begin{array}{r} 700 \\ -\,455 \\ \hline 245 \end{array}$

Notice that the top number in this subtraction has 2 zeros. You need tens and ones in 700. Why? Explain how the answer was found.

Dorothy's Pet Sheep

Here are Spook and Curly. Spook is the black lamb and Curly is the white lamb. Dorothy's father brought them to her when they were only a day old, because neither Spook's mother nor Curly's mother would claim her baby lamb.

1. When Spook was two days old, he could take 13 steps. Then his legs would give way and he would fall flat. Curly could take 21 steps without falling. How many more steps could Curly take than Spook could?

2. A week later, Spook weighed 18 pounds. Curly weighed 20 pounds. Find the difference in their weights.

3. Today Tony and his men sheared 986 pounds of wool. They sheared 729 pounds yesterday. How many more pounds did they shear today than yesterday?

4. The fastest man sheared 104 sheep. One of the men sheared 80 sheep. Find how many more sheep one man sheared than the other in the one day.

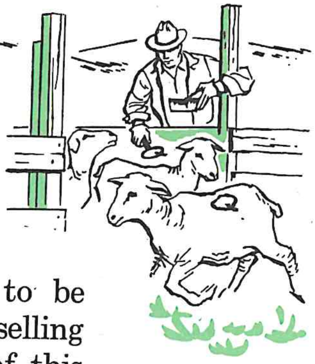
5. The 2-T Ranch had 832 sheep sheared today. Dorothy's father had 749 sheep sheared today. Find the difference in the number of sheep sheared on the two ranches.

6. Subtract:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
486	139	900	157	687	902	140	327	154	400
125	80	138	77	399	171	116	318	91	272

Story Problems and Exercises

Problems and Exercises



1. Sam helped his father drive the sheep to the branding pens. Today they branded 315 sheep. They branded 238 yesterday. How many more did they brand today than yesterday?

2. Sam's father is getting some sheep ready to be shipped. He had 910 sheep in one pasture. He is selling 346 of them. How many sheep will be left out of this flock?

3. Pat is taking a small flock of sheep to the summer range on Big Horn Mountain. There are 978 sheep in this flock. There are 9 black sheep in the flock and the rest are white. How many are white?

Subtract:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
4.	456 123	178 146	199 194	356 104	478 388	290 134	476 288	583 121	195 67	455 71
5.	868 105	571 138	469 127	388 111	155 107	165 77	359 125	227 106	721 138	431 122
6.	405 209	306 128	301 260	722 566	375 170	573 167	429 389	869 299	981 188	497 299
7.	285 188	678 484	288 199	971 186	319 179	754 347	666 487	372 288	515 195	463 363
8.	234 57	136 79	262 88	351 94	118 48	205 86	118 54	123 75	205 38	563 287
9.	654 239	493 258	691 274	208 194	204 157	605 329	467 235	394 273	765 253	699 278
10.	94 32	88 46	50 20	72 60	85 45	96 46	88 48	86 47	64 35	70 56

Dorothy Has a Birthday

Sam couldn't decide what to buy Dorothy for her birthday. It would be easy if she wanted something like a fishing pole, a knife, or a BB gun. Sam rode into town with his father a few days later. He went to the store, taking the two dollars that he had saved.

1. Sam saw this autograph book. He thought Dorothy would like it. It cost 69¢. How much money did he have left if he bought it?

$$\begin{array}{r} \$2.00 \\ -\ .69 \\ \hline \end{array}$$

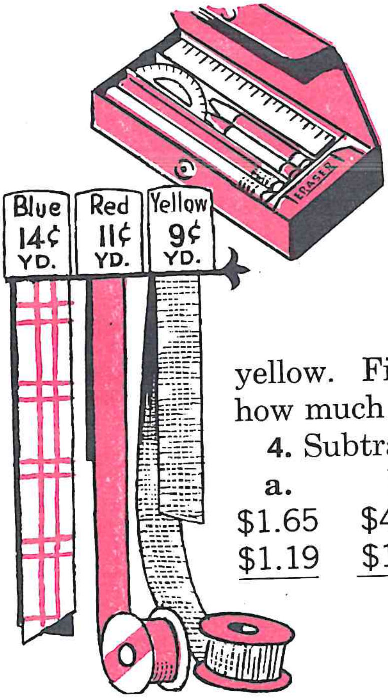
Do you see that two dollars written as $2.00 means no dimes and no pennies (no tens and no ones)?

You subtract the pennies or ones first. You can't take 9 from zero. There are no dimes which you can use.

$$\begin{array}{r} \$\overset{1}{\cancel{2}}.\overset{9}{\cancel{0}}\overset{10}{\cancel{0}} \\ -\ .69 \\ \hline \end{array}$$

You can make the $2.00 into twenty dimes and, if you use one of them, you will have 19 dimes left (1 dollar and 9 dimes).

Finish the subtraction.



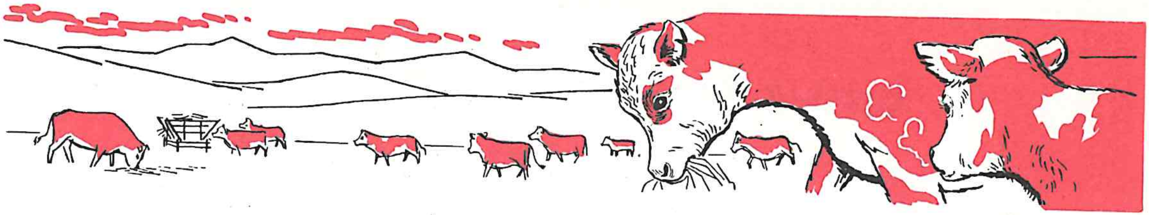
2. Sam bought this pencil box for 49¢. How much money did he have left? (Remember: he bought the autograph book in Problem 1.)

3. Dorothy always uses a lot of ribbon for her hair. Sam thought how much fun it would be if he bought some different kinds and wrapped each kind in a lot of paper. He bought 2 yards of red ribbon, 2 yards of blue, and 3 yards of yellow. Find how much the ribbon cost altogether, and how much Sam will have left after these purchases.

4. Subtract:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
$1.65	$4.00	$1.75	$10.00	$3.50	$7.80	$1.20
$1.19	$1.75	$ .55	$ 8.75	$1.95	$3.50	$1.12

Problems and Exercises



Sam and Dorothy Buy Calves and Raise Them

Two years ago Sam and Dorothy bought calves from their father. They had each calf's ear clipped in a certain way, so they could be told from any other calves on the range.

1. Sam paid $5.00 for each calf. Last fall his yearlings were rounded up and brought to the ranch. Sam paid his father $15.00 for hay to feed each of his yearlings. The cost of sending two of the yearlings to market was $6.25 each. Sam received $56.00 for each yearling. Find how much (profit) Sam made on each yearling.

2. Sam is keeping the third yearling. He figures that she will have a calf every year for four years. Each calf will be worth about $80.00 when it is a year old. He can sell the cow after four years for $120. How much will the cow and her calves be worth?

3. Dorothy bought two calves from her father. She paid $5.00 for each calf. She sold her calves at the end of the first year for $73.00 each. Find how much she made on her calves.

4. Dorothy has $5.40 in the bank. If she adds the amount she made on her calves to this amount, how much will she have in the bank?

5. Sam had $96.00 in the bank. He bought a new fishing pole for $9.50 and a leather jacket for $15.00. Find how much he had left in the bank.

6. Subtract:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
897	143	$89.56	$3.45	281	300	170	209
188	52	$17.95	$1.50	50	246	72	189

2-Step Problems

Getting Ready for Your Roundup

Add and check (don't copy; use paper for answers):

	a.	b.	c.	d.	e.	f.	g.	h.	i.
1.	271 9	89 25	36 17	54 19	77 38	35 19	99 34	67 28	53 28
2.	452 189	789 377	490 275	556 199	403 367	189 479	275 360	508 449	900 308
3.	17 18 34 37	29 26 18 54	38 16 27 16	47 38 16 15	66 15 38 27	59 12 19 34	83 15 17 35	74 37 28 17	56 15 36 18

Subtract and check: Illustration: $\begin{array}{r} 94 \\ -\,26 \\ \hline 68 \end{array}$ Check: $\begin{array}{r} 26 \\ +\,68 \\ \hline 94 \end{array}$

4.	94 18	73 49	80 35	71 26	55 19	62 45	27 18	85 46	36 17
5.	207 177	906 348	404 167	503 265	804 269	905 478	401 149	205 148	600 336

6. Answer these questions:

a. What number is 10 less than 165? **b.** How much more than 50 is 65? **c.** What number is 10 less than 405?

7. Tell how many hundreds, tens, and ones in these numbers:

a. 311 = ? hundreds, ? tens, and ? ones = ? tens and ? ones.
b. 608 = ? hundreds, ? tens, and ? ones = ? tens and ? ones.
c. 600 = ? hundreds, ? tens, and ? ones = ? tens and ? ones.

8. Add:

a.	b.	c.	d.
\$14.50 \$10.15	\$8.96 \$3.48	\$.68 \$.50	\$10.00 \$ 9.54

9. Subtract:

a.	b.	c.	d.
\$8.42 \$2.50	\$6.05 \$1.95	\$4.01 \$3.90	\$10.00 \$ 6.95

Unit Test

1. Add and check:

a.	b.	c.	d.	e.	f.	g.	h.	i.
568	904	368	145	715	25	18	45	19
127	4	166	274	104	16	27	16	15
136	12	275	167	100	15	19	16	27
					27	16	18	18

2. Subtract and check:

906	469	500	452	189	605	618	273	721
− 187	− 349	− 167	− 348	− 54	− 302	− 389	− 68	− 157

3. Subtract:

$10.00	$6.75	$1.00	$.57	$.25	$5.00	$9.52	$4.09	$2.06
2.75	1.37	.58	.23	.10	1.52	1.04	2.59	− 1.17

4. Add:

$5.98	$1.32	$.75	$9.68	$.50	$.29	293	485	591
6.12	1.02	.16	5.75	.18	.31	166	143	188

5. You go to the store for your mother and buy 2 cans of beans for 17¢ each, 1 package of cheese for 29¢, 3 cans of pears for 26¢ each. How much will these things cost? Find how much money you should receive in change from two one-dollar bills.

6. As soon as Sam gets home from school, he saddles his horse and rides off on errands or to do some other work. He kept count of the trips he made this week:

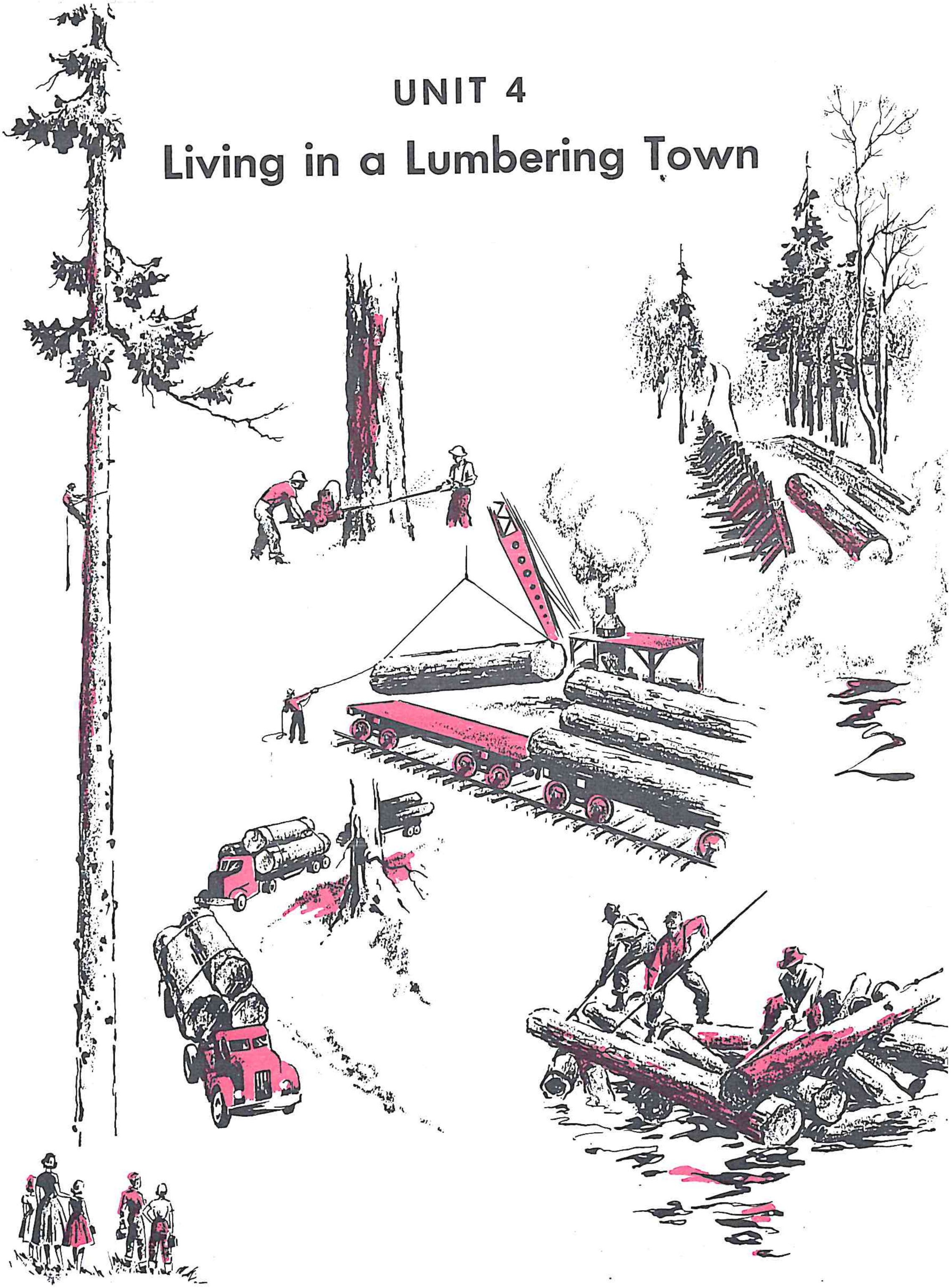
rode to Tom's sheep wagon, 7 miles
went to 2-T ranch on errand, 5 miles
fixed fence along Elm Creek, 6 miles
rode out to hayfield with water, 3 miles

Find the total distance Sam rode.

7. Sam and Dorothy ride 18 miles round trip to school on the school bus each day. How far do they ride in a school week of 5 days? Find the answer in 2 different ways.

UNIT 4

Living in a Lumbering Town



The boys and girls in this unit live in a lumber town. Many of their fathers work in the woods, but some of them work in the office at the lumber mill.

Did you ever plan to go anywhere on a trip with your classmates? These boys and girls are going to the woods to see where the logging is done. They are going to start in the morning and take their lunches with them. Everybody likes to eat, so the food committee was the first one chosen. Everyone is going to bring something. They will put all of it together when they have lunch. How will they need numbers in preparing enough lunch for everyone?

Can you think of some other committees which they might need? Would they need a nature study committee?

There are so many interesting things to see in the woods, and there are so many interesting jobs that the loggers have, that Chet cannot make up his mind which of the jobs he wants when he grows up.

You are going to see a new kind of *donkey* if you go along with them on this trip. This kind of donkey is a machine used to load logs on railroad cars. You will see the donkey moving logs through the air with chains and cables attached to the logs.

You will hear strange beeps made by a man blowing a whistle. He is called the *whistle punk* and is signaling to the man on the donkey. Do you have any idea what kind of messages he might send?

The *high climber* gets a free ride back and forth as the tree sways mightily when the top is cut off. Do you think it would be fun to be at the top of the tree as it sways back and forth?

Some of the men eat at the mess hall. Toby is the cook. What does he have to know about numbers to do the ordering of all the food?

In what ways do loggers use numbers in paying their bills and buying things?

Getting Ready for the Trip to the Logging Place

Charles can hardly wait until Friday. This is the day that Miss Hall and all the boys and girls in his room are going to the place where the logging crew is working. He thinks the best part of it is that Miss Hall and all his classmates chose him to be the leader.

Charles asked 3 children to help him decide what committees they will need and how many children there should be on each one.

They decided there should be 3 committees with 6 children on each one. They think there should be a food committee, a safety committee, and a committee that would get permission from the foreman to make the trip and find out just where to go.

Mike is on the safety committee. He has decided that red arm bands for everyone would be a good thing. But he cannot figure how many they will have if 6 of the children on his committee make 3 bands each.

Let's build the 3's.

Three 3's:

$$\begin{array}{ll} \left.\begin{array}{c}3\\3\end{array}\right> & 6\\ 3 & —3\\ \hline 9 & \end{array} \qquad \begin{array}{r}6\\+3\\\hline 9\end{array} \qquad \begin{array}{r}3\\\times 3\\\hline 9\end{array}$$

Six 3's:

$$\begin{array}{ll} \left.\begin{array}{c}3\\3\\3\end{array}\right> & 9\\ \left.\begin{array}{c}3\\3\\+3\end{array}\right> & 9\\ \hline 18 & \end{array} \qquad \begin{array}{r}9\\+9\\\hline 18\end{array} \qquad \begin{array}{r}3\\\times 6\\\hline 18\end{array}$$

Nine 3's:

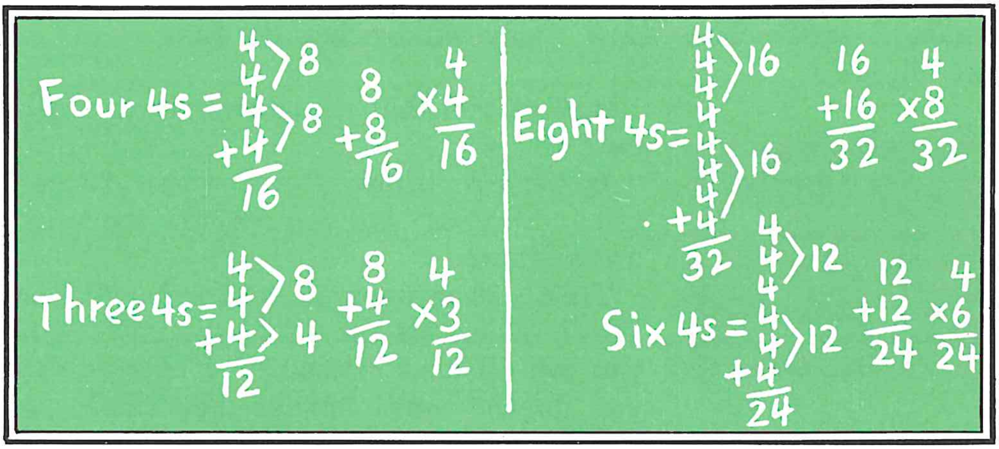
$$\begin{array}{ll} \left.\begin{array}{c}3\\3\\3\end{array}\right> & 9\\ \left.\begin{array}{c}3\\3\\3\end{array}\right> & 9\\ \left.\begin{array}{c}3\\3\\+3\end{array}\right> & 9\\ \hline 27 & \end{array} \qquad \begin{array}{r}9\\9\\+9\\\hline 27\end{array} \qquad \begin{array}{r}3\\\times 9\\\hline 27\end{array}$$

1. Multiply:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
$\begin{array}{r}3\\\times 2\\\hline\end{array}$	$\begin{array}{r}3\\\times 4\\\hline\end{array}$	$\begin{array}{r}3\\\times 8\\\hline\end{array}$	$\begin{array}{r}3\\\times 3\\\hline\end{array}$	$\begin{array}{r}3\\\times 6\\\hline\end{array}$	$\begin{array}{r}3\\\times 9\\\hline\end{array}$	$\begin{array}{r}3\\\times 5\\\hline\end{array}$	$\begin{array}{r}3\\\times 7\\\hline\end{array}$

Reviewing the 4's

Barbara is staying overnight with her friend Kathie. After dinner they decide to get ahead of the rest of the class by reviewing their 4's. Here is what they wrote on the blackboard in the kitchen:



Four 4s = 4 + 4 + 4 + 4 = 16; 4 + 4 = 8, 4 + 4 = 8
8 + 8 = 16
4 × 4 = 16
Three 4s = 4 + 4 + 4 = 12; 4 + 4 = 8, 4
8 + 4 = 12
4 × 3 = 12
Eight 4s = 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 = 32; 16, 16
16 + 16 = 32
4 × 8 = 32
Six 4s = 4 + 4 + 4 + 4 + 4 + 4 = 24; 12, 12
12 + 12 = 24
4 × 6 = 24

1. If three 4's = 12 and six 4's = 24, write nine 4's, and find out how many nine 4's are.

2. Show by adding how many three 4's and two 4's are. Then write the multiplication fact you learned by doing this.

3. Find how many seven 4's are by each of these addition problems: three 4's and three 4's and one 4.
three 4's and four 4's.

4. Kathie thinks the hardest one is $\begin{array}{r}4\\ \times 8\\ \hline\end{array}$. Do you know this one right off?

5. If you know how many eight 4's are, how can you find how many nine 4's are?

6. Count by 4's to 40.

7. Multiply:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
4	4	4	4	4	4	4	4	4
× 8	× 5	× 3	× 9	× 7	× 2	× 4	× 6	× 1

The Food Committee

The boys and girls told the food committee that they would like sandwiches, pickles, cookies, and apples. The food committee wants to know how much they need of all these things and how much each person should bring.

There are 28 people, counting Miss Hall. Everyone wants 2 sandwiches. How many sandwiches do they need in all?

$$\begin{array}{r l} 2 & \text{sandwiches} \\ \times\ 28 & \\ \hline 16 & \\ 4 & \\ \hline 56 & \text{sandwiches} \end{array}$$

a. Can you find the answer by counting by 2's?

b. Let's multiply: 8 × 2 ones = 16 or 1 ten and 6 ones. Do you see how the values are written?

Then, 20 × 2 or 2 tens × 2 = 4 tens. Why? Where are the 4 tens written? Could you use 40 ones instead of 4 tens? Could you do the multiplication like this? Tell why.

$$\begin{array}{r} 28 \\ \times\ 2 \\ \hline ? \end{array}$$

Six children said they would each bring 9 sandwiches. Henry wants to know if that will be enough, but he doesn't know how many six 9's are.

You can build the times facts about 9: Start with two 9's = 18 and three 9's = 27. Then six 9's = 27 + 27 = 54.

Build the remaining nines facts.

1. Would 6 children bringing 9 sandwiches each be enough?

2. Be sure you know all of these:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
9	3	3	9	3	9	9	9	9
× 2	× 9	× 6	× 7	× 6	× 9	× 6	× 1	× 5

3. Multiply:

19	19	29	49	19	43	26	19	19
× 3	× 5	× 3	× 2	× 2	× 2	× 3	× 6	× 4

How Many Cookies Are Needed?

$$\begin{array}{r} 3 \text{ cookies} \\ \times\, 28\phantom{\text{ cookies}} \\ \hline 24\phantom{\text{ cookies}} \\ 6\phantom{\text{ cookies}} \\ \hline 84 \text{ cookies} \end{array}$$

$$\begin{array}{r} 28 \\ \times\, 3 \\ \hline ? \end{array}$$

Everyone in the fifth grade likes the big sugar cookies the best of all—the kind with lots of sugar sprinkled over the top. Each boy and girl thought he could eat 3.

How many will they need if everyone is to have 3 cookies?

a. Can you find the answer by counting by 3's?

b. Multiplying: Why do you get 2 tens and 4 ones? How do you get 6 tens?

c. Does 28 × 3 give you the same answer as 3 × 28? Multiply 3 × 28 using tens and ones.

1. Nine of the children said they could bring some sugar cookies. Mike wanted to know how many cookies they would have if each of the 9 children brought 8 cookies each. Do you know? Let's build the facts about 8:

$$\begin{array}{r} 8 \\ +\,8 \\ \hline 16 \end{array} \quad \text{Two 8's} = ? \qquad \begin{array}{r} 8 \\ 8 \\ +\,8 \\ \hline 24 \end{array} \quad \text{Three 8's} = ? \qquad \begin{array}{r} 24 \\ 24 \\ +\,24 \\ \hline 72 \end{array} \quad \text{or} \quad \begin{array}{r} 8 \\ \times\,9 \\ \hline 72 \end{array}$$

Now build the remaining times facts about 8.

2. Would 9 children bringing 8 cookies each be enough? If not, how many cookies should each child bring?

Do you see that if you are trying to find how many nine 8's are, five 8's + four 8's is easy?

3. See how many you know at sight:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
$\begin{array}{r} 8 \\ \times\,3 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times\,9 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times\,6 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times\,5 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times\,7 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times\,2 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times\,8 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times\,4 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ \times\,8 \\ \hline \end{array}$

4. Multiply:

$$\begin{array}{r} 18 \\ \times\,5 \\ \hline \end{array} \quad \begin{array}{r} 28 \\ \times\,3 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ \times\,9 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ \times\,6 \\ \hline \end{array} \quad \begin{array}{r} 38 \\ \times\,2 \\ \hline \end{array} \quad \begin{array}{r} 58 \\ \times\,1 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ \times\,4 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ \times\,8 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ \times\,7 \\ \hline \end{array}$$

A Half Dozen Apples

The food committee has another problem. Seven of the children said they could bring a half dozen apples each. Will this be enough so everyone can have an apple with his lunch and another one in the middle of the afternoon? Let's review the 6's by building the facts. What would you use first? Then what would you do next?

Find all of the times facts about 6.

1. Would 7 half dozen apples be enough?

2. Multiply by writing the tens and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
18	16	16	28	26	18	18	16	16	24
× 4	× 2	× 6	× 2	× 3	× 5	× 4	× 4	× 3	× 3

3. Janet is planning to treat the class. She saw the kind of doughnuts she wants at the store. Each package has a half dozen doughnuts in it. If she buys 4 packages, how many doughnuts will she have? Will this be enough so everyone can have one doughnut? If not, how many more will she need?

4. After dinner, Janet helped her mother get a basket of fruit ready to take to three friends who are ill. Janet put a half dozen apples in each of the 3 baskets. How many apples did she use?

5. Janet's mother used the rest of the apples to make pies. She used a half dozen of the smaller apples for each of 4 pies. How many apples did she use to make the pies?

Be sure you know each fact at sight:

6.	3	6	8	6	8	3	3	9	3	9
	× 6	× 1	× 9	× 3	× 8	× 7	× 9	× 4	× 8	× 9
7.	6	3	9	8	9	3	9	8	8	6
	× 6	× 5	× 6	× 6	× 8	× 4	× 7	× 5	× 7	× 5

A Party at the Grange Hall

There is going to be a party at the Grange Hall tonight and everyone will be there. The lumber company is going to show a movie. There will be games and folk dancing and lots of food to eat for all the loggers and their families.

1. Beth's mother brought 4 pans of gingerbread. If each pan of gingerbread is cut into 8 pieces, how many pieces of gingerbread will there be?

2. Steven's mother made 3 cherry pies. She cut each pie into 6 pieces. How many pieces of cherry pie are there?

3. Marian counted 9 pies on one of the tables. Each pie was cut into 6 pieces. How many pieces of pie were cut?

4. John's mother cooks the best fried chicken in the town. She said she would fry all the chickens. She cut each chicken into 8 pieces. She fried 9 chickens. How many pieces of chicken did she fry?

5. Everyone wanted to dance "Four in a Boat." There were 8 people in each of 5 circles. How many people were dancing?

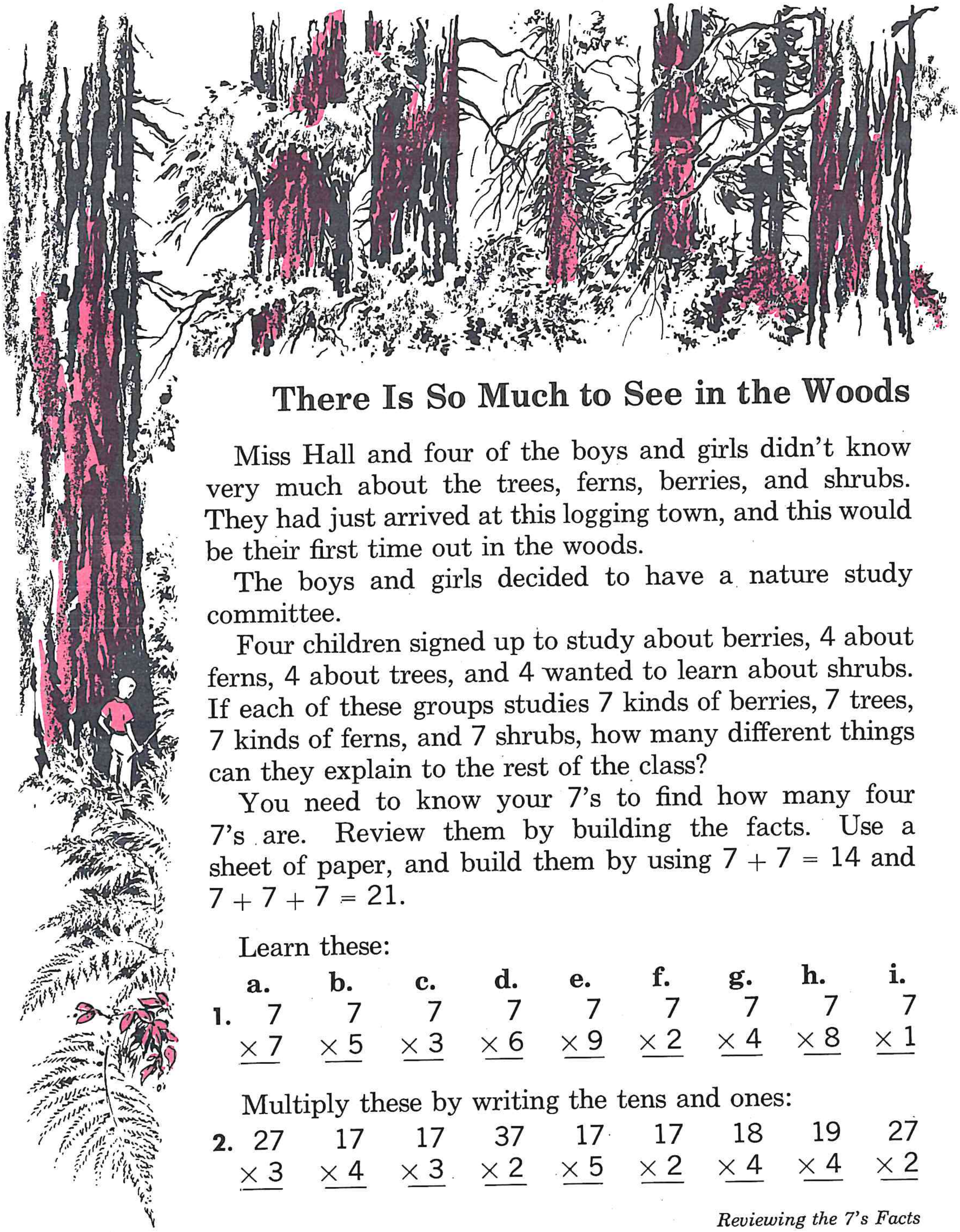
6. Bruce is helping set up the chairs for the movie. He is putting 8 chairs in each row. They have 7 rows set up. How many chairs are there so far?

7. After the main show they saw some moving pictures of the town's basketball team. The captain of the team said that each of the 5 players made 6 points in that game. How many points did the players make in all?

8. Multiply:

8	8	7	3	6	6	8	8	8	6
× 9	× 4	× 2	× 6	× 6	× 5	× 3	× 5	× 8	× 7
6	8	6	8	6	3	4	8	6	6
× 8	× 1	× 9	× 7	× 4	× 7	× 9	× 6	× 5	× 2

Practicing the 6's and 8's



There Is So Much to See in the Woods

Miss Hall and four of the boys and girls didn't know very much about the trees, ferns, berries, and shrubs. They had just arrived at this logging town, and this would be their first time out in the woods.

The boys and girls decided to have a nature study committee.

Four children signed up to study about berries, 4 about ferns, 4 about trees, and 4 wanted to learn about shrubs. If each of these groups studies 7 kinds of berries, 7 trees, 7 kinds of ferns, and 7 shrubs, how many different things can they explain to the rest of the class?

You need to know your 7's to find how many four 7's are. Review them by building the facts. Use a sheet of paper, and build them by using 7 + 7 = 14 and 7 + 7 + 7 = 21.

Learn these:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
1.	7 × 7	7 × 5	7 × 3	7 × 6	7 × 9	7 × 2	7 × 4	7 × 8	7 × 1

Multiply these by writing the tens and ones:

2.	27 × 3	17 × 4	17 × 3	37 × 2	17 × 5	17 × 2	18 × 4	19 × 4	27 × 2

Hal Is Going to Surprise the Class

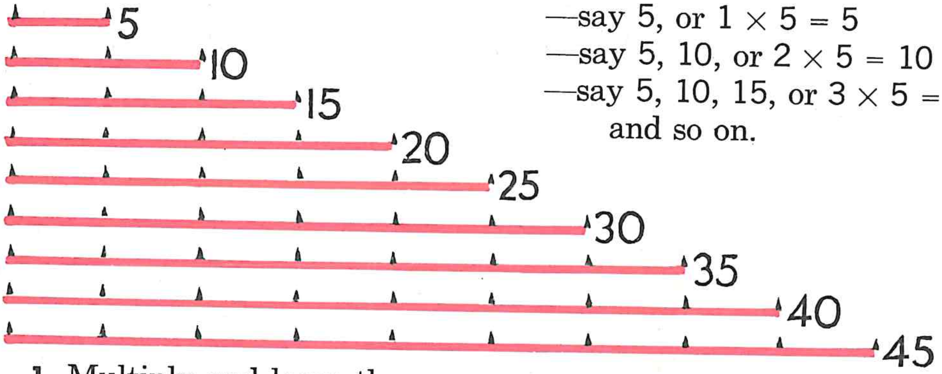
Hal has saved 9 nickels. He saw a package of bubble gum in the store with 30 pieces in it. Hal knew this would be enough for everyone. The box cost 35¢. Does Hal have enough money to buy the gum?

Hal can add:
5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = ?
5 + 5 = 10; 10 + 5 = 15 and
so on to 40 + 5 = 45

Hal can multiply:

$$\begin{array}{rl} 5¢ & \\ \times\ 9 & \text{or } 5¢ \text{ taken } 9 \text{ times} \\ \hline 45¢ & \end{array}$$

Which way is shorter, multiplying or adding? Do you know the 5's facts? Find them by counting by 5's using the following chart:



—say 5, or 1 × 5 = 5
—say 5, 10, or 2 × 5 = 10
—say 5, 10, 15, or 3 × 5 = 15
and so on.

1. Multiply and learn these:

a.	b.	c.	d.	e.	f.	g.	h.	i.	j.
5	5	5	5	5	5	5	5	6	8
× 2	× 4	× 8	× 3	× 6	× 9	× 5	× 7	× 8	× 9

2. Multiply by writing the tens and ones:

15	15	25	15	15	27	15	37	15
× 6	× 3	× 3	× 1	× 4	× 3	× 5	× 2	× 2

3. Multiply:

8	9	4	7	5	6	3	8	9	6
× 9	× 6	× 4	× 7	× 8	× 3	× 7	× 8	× 8	× 5

Do You Know Your Multiplication Facts?

Give the answers to these at sight:

	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.
1.	9 × 9	9 × 4	4 × 3	8 × 9	7 × 2	6 × 1	7 × 8	9 × 7	3 × 5	7 × 4
2.	2 × 9	5 × 2	7 × 1	8 × 4	6 × 8	2 × 7	5 × 3	6 × 4	9 × 6	8 × 5
3.	3 × 9	5 × 6	5 × 8	3 × 7	8 × 6	2 × 5	4 × 4	8 × 2	2 × 3	5 × 4
4.	4 × 9	4 × 7	2 × 6	4 × 5	3 × 4	6 × 3	9 × 5	2 × 4	4 × 8	5 × 7
5.	5 × 9	3 × 3	8 × 8	7 × 3	6 × 2	2 × 2	8 × 1	3 × 8	6 × 7	3 × 6
6.	5 × 5	6 × 9	7 × 6	3 × 2	9 × 2	2 × 8	7 × 7	6 × 5	9 × 3	4 × 2
7.	5 × 6	7 × 9	9 × 8	1 × 8	8 × 7	4 × 6	2 × 1	7 × 5	8 × 3	6 × 6

Do you remember when Mike wanted to know how many cookies he would have, if 9 children brought 8 cookies each? Could he do this? Would he get 72 children or 72 cookies?

$$\boxed{\begin{array}{r l} & 8 \text{ cookies} \\ \times & 9 \text{ children} \\ \hline & 72 \end{array}}$$

Helen said that Mike was taking 8 cookies 9 times. He is not multiplying by children; he is multiplying the number of times there are 8 cookies.

$$\begin{array}{r l} & 8 \text{ cookies} \\ \times & 9 \\ \hline & 72 \text{ cookies} \end{array}$$

8. Multiply by writing the tens and ones:

a.	b.	c.	d.	e.	f.	g.	h.
15 × 6	17 × 5	23 × 3	18 × 4	15 × 5	21 × 4	19 × 4	32 × 3

9. Write the multiplication tables of 3's, 5's, 6's, 8's, and 9's.

Chris Explains Something

Chris does not write the tens and ones when he multiplies. He *thinks* the tens and ones without writing them. Before you look at his problem, estimate the answer yourself so you can tell if his answer could be correct.

$$\begin{array}{r} 16 \\ \times 4 \\ \hline 24 \end{array}$$

Now look at Chris' work:

16 = 1 ten and 6 ones or 10 ones + 6 ones.

I will multiply the 6 ones first: 4 × 6 ones = 24 ones. I will write 24 ones in the answer.

Do you see that 24 ones are 2 tens and 4 ones? Are the 2 tens in tens place? Are the 4 ones in ones place?

$$\begin{array}{r} 16 \\ \times 4 \\ \hline 24 \\ 40 \\ \hline \end{array}$$

Now I will multiply the tens: 4 × 10 ones = 40 ones, or 4 tens and 0 ones. I will write 4 in tens place and 0 in ones place.

$$\begin{array}{r} 16 \\ \times 4 \\ \hline 24 \\ 4 \\ \hline 64 \end{array}$$

I could also think: 4 × 1 ten = 4 tens. Then I could write 4 in tens place. Do you see that 4 written in tens place is the same as 40 ones?

I must add to find how many tens and ones I have. Is 64 the answer? Explain.

Mary wanted to know what Chris would do if he had a large number like 3 × 85. Estimate the answer. 85 is close to 90. What are three 90's?

$$\begin{array}{r} 85 \\ \times 3 \\ \hline 15 \end{array}$$

Multiply the ones: 3 × 5 ones = 15 ones.

Multiply the tens: 3 × 8 tens are 24 tens.

$$\begin{array}{r} 85 \\ \times 3 \\ \hline 15 \\ 24 \\ \hline 255 \end{array}$$

Chris said, "I cannot get the 24 in tens place because I do not have room, but I can put the 4 in tens place and the 2 in hundreds place. I can do this because 24 tens are 2 hundreds and 4 tens. Add to find the answer.

1. Multiply these as Chris did:

a. $\begin{array}{r} 16 \\ \times 4 \\ \hline \end{array}$

b. $\begin{array}{r} 15 \\ \times 3 \\ \hline \end{array}$

c. $\begin{array}{r} 13 \\ \times 6 \\ \hline \end{array}$

d. $\begin{array}{r} 17 \\ \times 2 \\ \hline \end{array}$

Larry Explains How He Multiplies

Larry took the same problems Chris did, so he could show how he does his multiplication. Look at Larry's way of multiplying.

$$\begin{array}{r} 16 \\ \times\ 4 \\ \hline 4 \end{array}$$

$$\begin{array}{r} 16 \\ \times\ 4 \\ \hline 64 \end{array}$$

I first multiply the ones: 4 × 6 ones = 24 ones. 24 ones = 2 tens and 4 ones. I will write 4 in ones place in the answer, and hold the 2 tens in my head until I have multiplied the tens. Then I will add the tens.

Now I will multiply the tens: 4 × 1 ten = 4 tens. 4 tens and the 2 tens I held are 6 tens. I will write 6 in tens place in the answer. My answer is 64.

Then Larry took the problem Mary had wanted to know about. This is the way he did it.

$$\begin{array}{r} 85 \\ \times\ 3 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 85 \\ \times\ 3 \\ \hline 255 \end{array}$$

I will multiply the ones: 3 × 5 ones = 15 ones. I write the 5 ones, and hold the 1 ten in my head.

Multiply the tens: 3 × 8 tens are 24 tens. 24 tens and 1 ten held are 25 tens.

I cannot put 25 in tens place because there is no room. 25 tens = 2 hundreds and 5 tens, so I will put 5 in tens place and 2 in hundreds place.

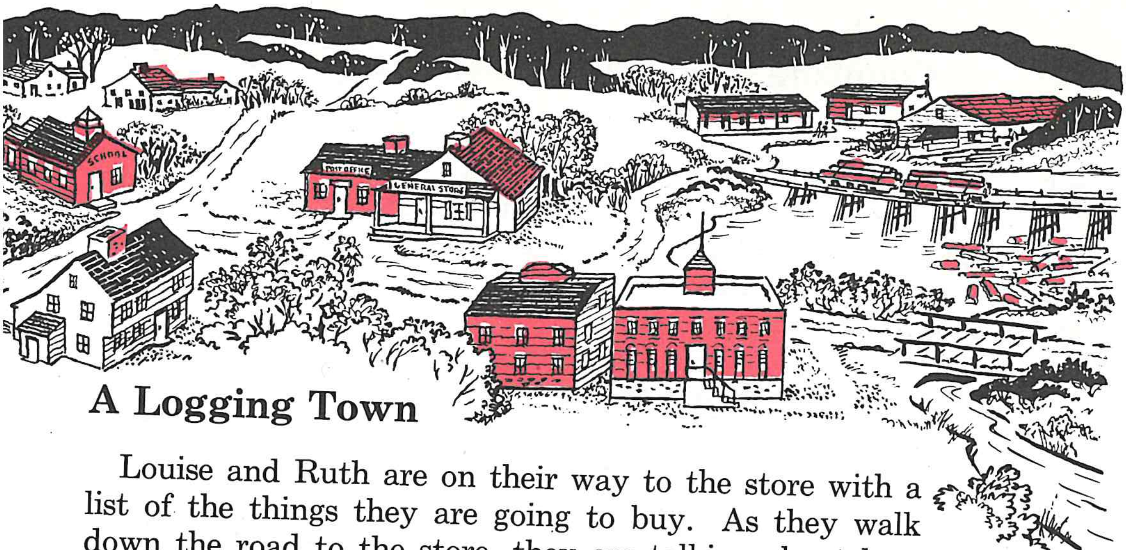
My answer is 255.

1. Multiply these as Larry did:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
24	15	37	18	19	31	17	16	27
× 5	× 7	× 4	× 9	× 7	× 6	× 8	× 4	× 7

2. Multiply these as Chris did without holding tens:

22	17	18	29	14	15	19	23	42
× 5	× 7	× 9	× 2	× 6	× 8	× 8	× 7	× 3



A Logging Town

Louise and Ruth are on their way to the store with a list of the things they are going to buy. As they walk down the road to the store, they are talking about how much they like Brookdale, the town where they live. They like the smell of the new lumber, the little creek that runs through the town, and the hills covered with trees.

1. Ruth is going to buy bread to make her sandwiches for the picnic. How many slices will she need if she is going to make 9 large sandwiches?

2. Ruth's mother gave her a list of the things she wants Ruth to get for her. The things on the list were 2 packages of dye, 3 cards of buttons, and 7 yards of red ribbon.

Ruth found that dye was 15¢ a package at the store, buttons were 25¢ a card, and the red ribbon was 12¢ a yard.

Step 1: Estimate the total cost of the things Ruth is to buy.

Step 2: Find the cost of each thing:

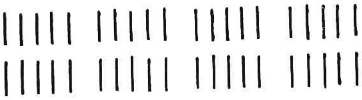
dye, 15¢	buttons, 25¢	bread, 21¢	ribbon, 12¢
× 2	× 3	× 1	× 7

Step 3: Add the cost of all the things to find the total.

3. Louise bought 3 loaves of wheat bread at 24¢ each, 2 cans of tuna fish at 38¢ each, a head of lettuce for 12¢. Find the cost of the things Louise bought.

Counting the Logs on the Flat Cars

Al and Chet were down by the creek trying to catch some tadpoles when the engine whistle blew. They ran as fast as their legs could carry them so they could see how many logs were coming on the flat cars. The small engine chugged slowly past with 15 logs on each flat car. There are 8 flat cars. How many logs are there in all? Estimate your answer. What are two 15's? Then how many do you think eight 15's would be?



Al figured it this way:

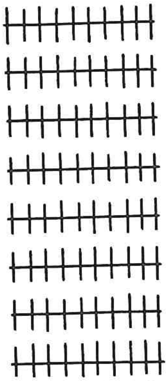
$$\begin{array}{r}15\\ \times\ 8\\ \hline 40\end{array}$$

He multiplied the ones first. Is 40 correct? Do 40 ones equal 4 tens and no ones?

$$\begin{array}{r}15\\ \times\ 8\\ \hline 40\\ 80\\ \hline 120\end{array}$$

He multiplied 1 ten (10 ones) 8 times. (10, 20, 30, 40, 50, 60, 70, 80.) Do 80 ones equal 8 tens?

Are there any ones to add? How many are 4 tens and 8 tens? Do 12 tens equal 1 hundred + 2 tens?



Chet figured it this way:

$$\begin{array}{r}15\\ \times\ 8\\ \hline 0\end{array}$$

He knew that Al was right in the way he figured it, but he thought it took too long his way. He multiplied 8 × 5 ones. How many are 8 groups of 5 ones? Why did he put 0 in ones place? What did he do with the 4 tens?

$$\begin{array}{r}15\\ \times\ 8\\ \hline 120\end{array}$$

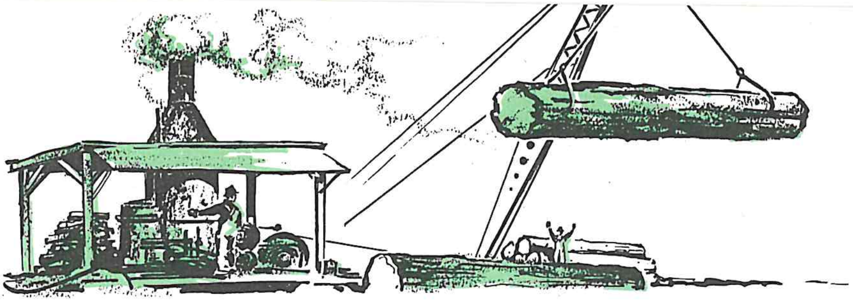
Then he multiplied the tens. 8 × 1 ten = 8 tens; these 8 tens and the 4 tens (held from multiplying the ones) = 12 tens. Could he put the 12 in tens place? Why not?

1. Do these as Al did:

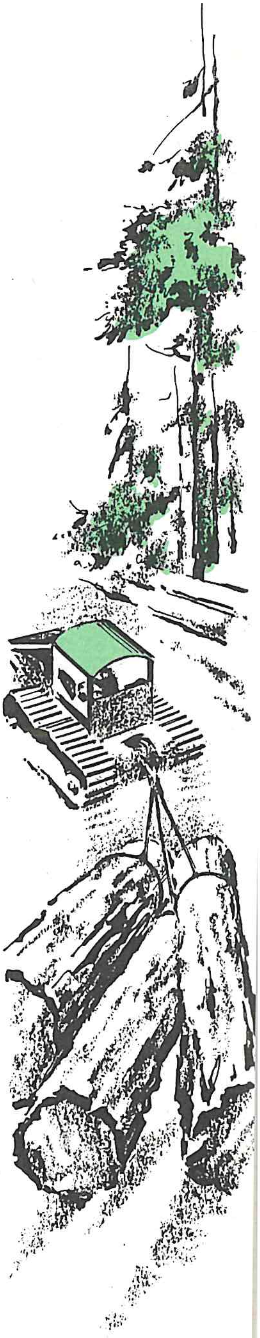
a.	**b.**	**c.**	**d.**	**e.**
$\begin{array}{r}27\\ \times 4\\ \hline\end{array}$	$\begin{array}{r}28\\ \times 2\\ \hline\end{array}$	$\begin{array}{r}15\\ \times 8\\ \hline\end{array}$	$\begin{array}{r}19\\ \times 3\\ \hline\end{array}$	$\begin{array}{r}34\\ \times 3\\ \hline\end{array}$

2. Do these as Chet did:

a.	**b.**	**c.**	**d.**	**e.**
$\begin{array}{r}16\\ \times 7\\ \hline\end{array}$	$\begin{array}{r}14\\ \times 3\\ \hline\end{array}$	$\begin{array}{r}35\\ \times 6\\ \hline\end{array}$	$\begin{array}{r}18\\ \times 9\\ \hline\end{array}$	$\begin{array}{r}45\\ \times 4\\ \hline\end{array}$



Chet Sees a New Kind of Donkey



Chet had just come to Brookdale to live. He didn't know anything about logging. When Ben told him he was going to see a donkey, Chet was happy. He liked donkeys with their big ears and their soft noses.

It took an hour for Miss Hall and the children to walk to where the logging was going on. The safety committee kept close watch for logging trains.

At last they came to a place where some men were working. They saw a very large machine. A man was sitting inside moving levers in order to move a log along a cable. The machine then lifted and laid the log on top of a flat car.

"The machine is called a donkey. It works all the cables to bring in the logs," said Ben.

The foreman told the boys and girls that now most of the logs are taken to the loading place by a caterpillar tractor that drags the logs behind it. These tractors are called "cats" and can go up and down steep places. He also told them that very few donkeys are used any more.

The man in the donkey said they loaded 132 logs each day for 3 days:

$$\begin{array}{r} 132 \\ \underline{\times\ 3} \end{array} = \begin{array}{r} 1 \text{ hundred } + 3 \text{ tens } + 2 \text{ ones} \\ \underline{\times\ 3} \\ 3 \text{ hundreds } + 9 \text{ tens } + 6 \text{ ones} \end{array} = 396 \text{ logs}$$

1. Multiply by writing out the hundreds, tens, and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
124	112	222	103	212	420	133	123
× 2	× 4	× 4	× 4	× 4	× 2	× 3	× 3

Practice for Skill

Now that you know how to multiply the ones, the tens, and the hundreds, you can do it without writing the names of the places:

$$\begin{array}{r} 124 \\ \times\ 2 \\ \hline 248 \end{array}$$

2 × 4 ones = 8 ones.
2 × 2 tens = 4 tens.
2 × 1 hundred = 2 hundreds.

Multiply:

	a.	b.	c.	d.	e.	f.	g.	h.
1.	421 × 2	314 × 2	122 × 4	332 × 3	121 × 4	433 × 2	123 × 3	313 × 2
2.	133 × 3	214 × 2	312 × 3	411 × 2	210 × 4	400 × 2	222 × 4	111 × 3

3. Multiply by writing the tens and ones:

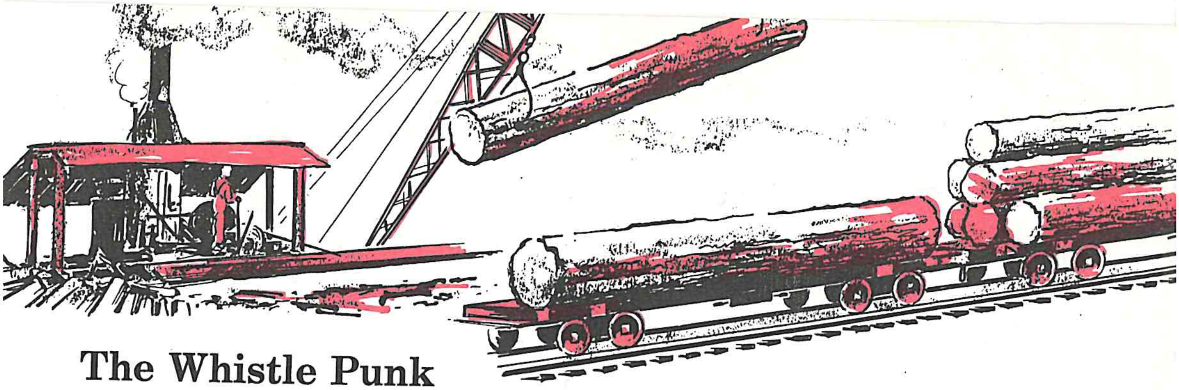
$$\begin{array}{r} 24 \\ \times\ 4 \\ \hline 16 \\ 8 \\ \hline 96 \end{array}$$

28 × 4	14 × 5	25 × 4	17 × 4	16 × 6	14 × 9	24 × 4	19 × 5

Multiply by holding the tens, as you see in this example:

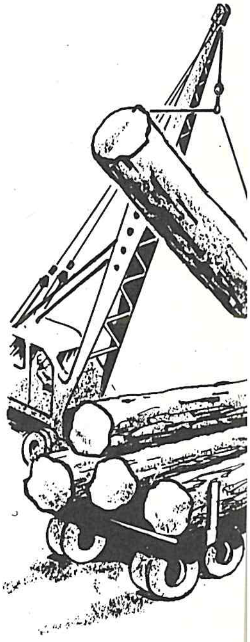
$$\begin{array}{r} 26 \\ \times\ 5 \\ \hline 130 \end{array}$$

4.	45 × 7	19 × 8	27 × 5	38 × 7	14 × 8	17 × 9	28 × 4	19 × 6
5.	39 × 5	48 × 8	56 × 9	74 × 7	39 × 4	27 × 6	38 × 3	56 × 7
6.	27 × 7	45 × 8	63 × 9	81 × 8	27 × 9	39 × 8	54 × 7	19 × 9
7.	76 × 7	55 × 9	32 × 6	71 × 8	64 × 4	88 × 8	93 × 7	44 × 8



The Whistle Punk

Miss Hall and the boys and girls watched the donkey work. They couldn't take their eyes off the log in the air above them. They saw it come closer to the donkey. The man in the donkey kept moving the levers. The huge log stopped right above the flat car. It was lowered slowly, and moved a little this way and that way, until it was laid exactly in place on the flat car.



Then everyone heard a strange whistle. "That is a man called a whistle punk," Ben told them. "He is signaling that another log is ready for the donkey to load."

The donkey gave a sharp whistle. The whistle punk kept signaling. He was telling the man on the donkey just what to do in moving the log.

When Chet found out that there were very few donkey engines any more and that there would be no need for whistle punks, he decided he would run one of the big machines when he grew up.

Help Chet with the following exercises:

The donkey doesn't load logs on the cars every day. These exercises are about the logs loaded during 4 different weeks. Write a word problem for each one, and then solve it:

	a.	b.	c.	d.
1.	141 × 2	132 × 3	123 × 3	142 × 2
2.	112 × 2	133 × 3	121 × 4	131 × 2
3.	17 × 9	28 × 6	35 × 4	44 × 8
4.	61 × 5	75 × 7	38 × 4	76 × 3

Practice in Multiplying

Hundreds of Logs

The foreman told the boys and girls that the loggers take out about 287 logs a month. How many logs is this in three months?

This is a long way to do the work:

$$\begin{array}{cccc} & 2 & 8 & 7 \\ \times & & & 3 \\ \hline & & 2 & 1 \\ & 2 & 4 & \\ & 6 & & \\ \hline & 8 & 6 & 1 \end{array}$$

3 × 7 ones = 21 ones. Do 21 ones equal 2 tens and 1 one?

3 × 8 tens = 24 tens.

You cannot write 24 in tens place. Write 2 in hundreds place and 4 in tens place. Why can you do this?

Now multiply the hundreds. 3 × 2 hundreds = 6 hundreds.

Write 6 in hundreds place under the 2 hundreds. Add the place values. The answer is 861.

1. Multiply by writing the ones, tens, and hundreds:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
196	265	187	199	176	158	174	275
× 5	× 2	× 5	× 4	× 5	× 6	× 5	× 3

You could multiply by holding the tens and hundreds:

$$\begin{array}{r} 287 \\ \times\ 3 \\ \hline 1 \end{array}$$

3 × 7 ones = 21 ones. Write 1 in ones place in the answer, and hold the 2 tens.

$$\begin{array}{r} 287 \\ \times\ 3 \\ \hline 61 \end{array}$$

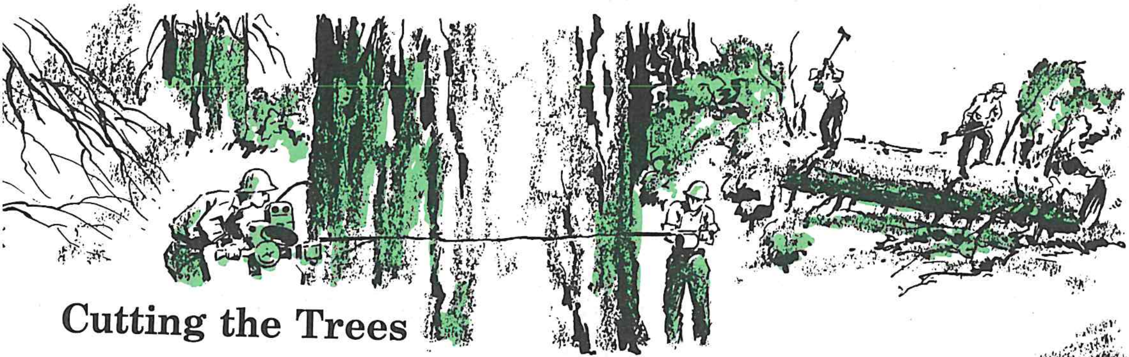
Multiply the tens: 3 × 8 tens = 24 tens. (it could be 3 × 80 = 240 or 24 tens) 24 tens and the 2 tens you held from ones place = 26 tens. Write 6 in tens place in the answer, and hold the 2 hundreds.

$$\begin{array}{r} 287 \\ \times\ 3 \\ \hline 861 \end{array}$$

Multiply the hundreds: 3 × 2 hundreds (it could be 3 × 200) = 6 hundreds. 6 hundreds and the 2 hundreds you held from tens place = 8 hundreds. Write 8 in hundreds place in the answer. Your answer is 861 logs.

2. Multiply by holding the tens and hundreds:

145	167	325	184	159	138	129	127
× 6	× 5	× 2	× 5	× 6	× 6	× 7	× 5



Cutting the Trees

The children and Miss Hall followed the foreman a mile and a half to where the men were cutting trees. They stood a short distance from where two men were just finishing sawing a tree. They saw the huge tree begin to sway.

"Timber!" shouted one of the men. Both men ran so that they wouldn't get pinned under the tree. The tree fell with a mighty crash, just where the men wanted it to fall.

1. The boys and girls saw 6 crews of men cutting the limbs and branches off the logs. There were 4 men in each crew. How many men were doing this work?

2. One of the men said the tree they just cut was 79 feet tall. They cut 5 trees about that length this week. About what was the length of the 5 trees altogether?

3. The children ate lunch with one of the crews. Each of the 4 men on the crews ate 2 sandwiches. Each of the 28 people from the school ate 2 sandwiches. Find how many sandwiches were eaten in all.

4. The men said it took them about 55 minutes to take the branches off each tree after it had been felled. If they felled 4 trees, how many hours and minutes did they work?

5. Multiply:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
139	54	68	217	118	45	78	94
× 7	× 8	× 9	× 3	× 7	× 6	× 6	× 5

Lumber to Build Things

The foreman told Chet that they had taken about 15 logs out of the woods every day for the past 12 working days. Chet knew that was a lot of logs, but he didn't know exactly how many. First he *estimated* his answer: Two 15's are 30; they take out 30 logs in 2 days. So in 6 days, it would be three times this amount, or 30 + 30 + 30 = 90 logs in 6 days. In 12 days, they would take out twice the number they took out in 6 days, or two 90's, which would be 180 logs.

Work the problem with Chet:

$$\begin{array}{r} 15 \text{ logs} \\ \times\ 12\phantom{\text{ logs}} \\ \hline ?\ \text{logs} \end{array}$$

Chet does not know how to multiply by a 2-place number. He can do the problem in parts of 6 and 6, and then add the answers to find the total.

$$\begin{array}{r} 15 \text{ logs} \\ \times\ 6\phantom{\text{ logs}} \\ \hline 90 \text{ logs} \end{array}$$

$$\begin{array}{r} 90 \text{ logs in 6 days} \\ 90 \text{ logs in 6 days} \\ \hline 180 \text{ logs in 12 days} \end{array}$$

The men take out 15 logs for each of the 6 days, or six 15's.

The answer to this is 90 logs in 6 days. For 12 days he added 90 and 90 and got 180.

Chet could have used parts of 12 other than 6 and 6. He could have used 9 and 3, for example.

$$\begin{array}{r} 17 \\ \times\ 14 \\ \hline ? \end{array}$$

$$\begin{array}{r} 17 \\ \times\ 6 \\ \hline 102 \end{array}$$

$$\begin{array}{r} 17 \\ \times\ 8 \\ \hline \end{array}$$

To multiply 17 by 14, estimate your answer first: 17 is close to 20, so what are fourteen 20's?

You cannot multiply by 14. What parts of 14 will you use? Use 6 and 8.

Multiply the ones. How many tens did you hold?

Multiply the tens. How many tens did you have in all? Why is the 1 in hundreds place?

Multiply the ones: 8 × 7 ones = ? ones. Finish multiplying. Add the answers to find the total.

Learning More about Multiplication

Chet is going to try to multiply by using the parts which you see in a number.

$$\begin{array}{r} 32 \\ \times\ 24 \\ \hline \end{array}$$

He knows that he must first multiply 32 by the 4 in ones place, and then by 2 in tens place. If he were to write it out, it would be like this:

$$\begin{array}{r} 32 \\ \times\ 24 \\ \hline \end{array} = \begin{array}{r} 3\text{ tens} + 2\text{ ones} \\ \times\ 4 \\ \hline 12\text{ tens} + 8\text{ ones} \end{array} \quad \text{and} \quad \begin{array}{r} 3\text{ tens} + 2\text{ ones} \\ \times\ 20 \\ \hline 60\text{ tens} + 40\text{ ones} \end{array}$$

Then he must add these 2 parts. What do you get?

If he thinks the tens and ones, his work is like this:

$$\begin{array}{r} 32 \\ \times\ 24 \\ \hline 128 \end{array}$$

Multiply by 4 in ones place: 4 × 2 ones = 8 ones. Write 8 in ones place.

4 × 3 tens = ? Remember that 3 tens = 30. It is hard to think what four 30's are, so think of 4 × 3 tens = 12 tens. 12 tens = 1 hundred and 2 tens.

$$\begin{array}{r} 32 \\ \times\ 24 \\ \hline 128 \\ 40 \end{array}$$

Do you get the same value as that shown above? Why?

He must next multiply by the 2 in tens place in 24. Stop and think that the 2 in 24 must be 20 since 24 = 20 + 4.

He begins by thinking: 20 × 2 ones (20 × 2) = 40 ones. Check this before you go on. You took 2 ones 20 times. Write the 40 ones as 4 tens and 0 ones. (He could hold the 4 tens because there are other tens to be found.)

$$\begin{array}{r} 32 \\ \times\ 24 \\ \hline 128 \\ 640 \\ \hline 768 \end{array}$$

Now multiply 3 tens by 2 in tens place. What he has is 20 × 3 tens. 20 × 3 tens = 60 tens, or 6 hundreds. Write 6 in hundreds place. (If you had held the 4 tens, you would now have 64 tens, or 6 hundreds and 4 tens. Why?) The answer is 768. Why?

Practice in Multiplying

$$\begin{array}{r}27\\ \times 14\\ \hline\end{array} = \begin{array}{r}2\text{ tens} + 7\text{ ones}\\ \times 4\\ \hline 8\text{ tens} + 28\text{ ones}\end{array} + \begin{array}{r}2\text{ tens} + 7\text{ ones}\\ \times 10\\ \hline 20\text{ tens} + 70\text{ ones}\end{array} = \begin{array}{r}8\text{ tens} + 28\text{ ones}\\ 20\text{ tens} + 70\text{ ones}\\ \hline 28\text{ tens} + 98\text{ ones}\end{array} = ?$$

1. Multiply by writing the name of the place in the number to be multiplied, as shown above:

a.	b.	c.	d.	e.	f.	g.	h.
23	36	27	32	26	24	33	17
× 16	× 14	× 12	× 13	× 12	× 14	× 13	× 23

Answer these questions:

$$\begin{array}{r}16\\ \times 23\\ \hline 8\end{array}$$

2. How many are 3 × 6 ones? What figure do you write in ones place under the line? How many tens do you hold?

3. How much is 3 × 1 ten? Adding these tens and the tens you held, how many tens do you have? Write these tens in tens place under the line.

$$\begin{array}{r}16\\ \times 23\\ \hline 48\end{array}$$

4. Now multiply by the 2 in 23. How do you know that the 2 = 20 or 2 tens?

5. 20 × 6 ones = 120 ones. Write the 20 ones. How many hundreds do you hold?

$$\begin{array}{r}16\\ \times 23\\ \hline 48\\ 320\\ \hline ?\end{array}$$

6. How much is 20 × 1 ten? How many hundreds do you get? Adding these hundreds and the hundreds you held, how many hundreds do you have in all?

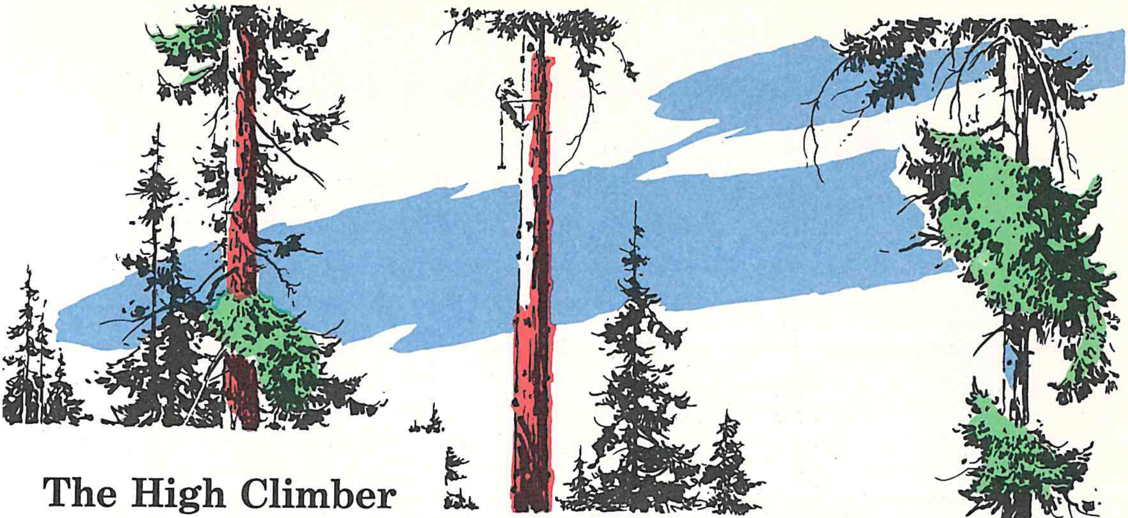
7. Multiply by thinking hundreds, tens, and ones:

$$\begin{array}{r}18\\ \times 23\\ \hline 54\\ 360\\ \hline 414\end{array}$$

19	28	17	31	41	16	12	34
× 22	× 14	× 22	× 15	× 17	× 13	× 14	× 12

8. Tell how many:

a. Thirty 4's = ?
b. Twenty 2's = ?
c. Ten 5's = ?
d. Forty 2's = ?
e. Thirty 3's = ?
f. Twenty 5's = ?
g. Twenty 4's = ?
h. Ten 6's = ?
i. Ten 3's = ?



The High Climber

The foreman asked the boys and girls if they would like to watch the high climber work. The high climber climbs to the top of the tree and cuts off the top before the tree is cut.

Ted is the high climber. He was just getting ready to climb a tree. He had metal spikes on his boots to help him climb the tree. He had a heavy belt around his waist. He used a rope to help him climb. He would climb a few feet and then swing the rope farther up the tree. At last he was so far up the tree that the children could hardly see him.

1. One week Ted topped 12 trees that averaged 67 feet in height. If Ted climbed about 59 feet on each of these trees, how many feet did he climb in all?

2. Ted is paid $49.00 a day. How much does he earn in a week of 5 working days?

3. It took Ted 4 minutes to top a tree. About how many minutes would it take him to top 12 trees this size?

4. It takes Ted 2 minutes to climb 20 feet. About how long would it take him to climb a tree 80 feet tall?

The children watched Ted. All at once the top of the tree fell to the ground. Ted held tight to the tree while it swayed back and forth. Chet said, "I'm going to be a high climber when I grow up."

Problems

A Shorter Way to Multiply by a 2-Place Number

$$\begin{array}{r} \textbf{a.} \\ 32 \\ \times\, 24 \\ \hline 128 \end{array} \qquad \begin{array}{r} \textbf{b.} \\ 32 \\ \times\, 24 \\ \hline 128 \end{array}$$

or

$$\begin{array}{r} 32 \\ \times\, 24 \\ \hline 128 \\ 640 \\ \hline 768 \end{array} \qquad \begin{array}{r} 32 \\ \times\, 24 \\ \hline 128 \\ 64 \\ \hline 768 \end{array}$$

4 × 2 ones = 8 ones. Write 8 in ones place. 4 × 3 tens = 12 tens. You cannot put 12 tens in tens place. Does 12 tens = 1 hundred and 2 tens? Write 1 in hundreds place and 2 in tens place.

Now you multiply by the 2 tens. In the example **a** you multiply 20 × 2 ones and write 40 ones.

In example **b** you multiply 2 ones by 2 in tens place and write 4 in tens place. Does this mean that tens times ones = tens?

These are both right; 40 ones = 4 tens.

Now in **a** 20 × 3 tens = ? 60 tens is the same as 6 hundreds. Write 6 in hundreds place.

In **b** 2 in tens place × 3 tens = 6 hundreds. Why? Does tens times tens = hundreds?

Answer these questions:

$$\begin{array}{r} \textbf{a.} \\ 43 \\ \times\, 23 \\ \hline 129 \\ 60 \end{array} \quad \text{or} \quad \begin{array}{r} \textbf{b.} \\ 43 \\ \times\, 23 \\ \hline 129 \\ 6 \end{array}$$

$$\begin{array}{r} 43 \\ \times\, 23 \\ \hline 129 \\ 860 \\ \hline \end{array} \qquad \begin{array}{r} 43 \\ \times\, 23 \\ \hline 129 \\ 86 \\ \hline \end{array}$$

1. Multiply the ones. 3 × 3 ones = 9 ones. In what place must the 9 be written?

2. Multiply the tens. 3 × 4 tens = 12 tens. What number goes in tens place? in hundreds place?

3. Multiply by the 2 tens in 23. Why is it right to write 60 with 0 in ones place in **a** or just write 6 in tens place in **b**? Which way is shorter?

4. Explain the rest of the multiplication, and find the answer.

5. Multiply:

$$\begin{array}{r} \textbf{a.} \\ 13 \\ \times\, 24 \\ \hline \end{array} \quad \begin{array}{r} \textbf{b.} \\ 12 \\ \times\, 32 \\ \hline \end{array} \quad \begin{array}{r} \textbf{c.} \\ 23 \\ \times\, 33 \\ \hline \end{array} \quad \begin{array}{r} \textbf{d.} \\ 14 \\ \times\, 21 \\ \hline \end{array} \quad \begin{array}{r} \textbf{e.} \\ 52 \\ \times\, 34 \\ \hline \end{array} \quad \begin{array}{r} \textbf{f.} \\ 34 \\ \times\, 26 \\ \hline \end{array} \quad \begin{array}{r} \textbf{g.} \\ 26 \\ \times\, 31 \\ \hline \end{array} \quad \begin{array}{r} \textbf{h.} \\ 18 \\ \times\, 36 \\ \hline \end{array} \quad \begin{array}{r} \textbf{i.} \\ 15 \\ \times\, 42 \\ \hline \end{array}$$

Multiplying by Zero

When you multiply 0 times any number, you have 0. 0 × 8 = 0 because you are taking 8 no times at all.

You can write the zeros when you multiply by 0:

$$\begin{array}{r} 28 \\ \times\ 10 \\ \hline 00 \end{array}$$

Multiply by the 0 in ones place:

0 × 8 ones = 0 ones. Write 0 in ones place.

0 × 2 tens = 0 tens. Write 0 in tens place.

Multiply by the 1 in tens place:

$$\begin{array}{r} 28 \\ \times\ 10 \\ \hline 00 \\ 28 \\ \hline 280 \end{array}$$

1 ten × 8 ones (10 × 8) = 8 tens. Write 8 in tens place.

1 ten × 2 tens (10 × 20) = 2 hundreds. Write 2 in hundreds place.

Add the ones, tens, and hundreds to find the answer.

You can also multiply by writing only 1 zero to show you have no ones:

Multiply by the 0 in ones place:

$$\begin{array}{r} 28 \\ \times\ 10 \\ \hline 0 \end{array}$$

There is a 0 in ones place. You can write 0 in ones place below the line to show there are not any in ones place.

Multiply by the 1 in tens place:

$$\begin{array}{r} 28 \\ \times\ 10 \\ \hline 280 \end{array}$$

1 ten × 8 ones (10 × 8) = 8 tens. Write 8 in tens place.

1 ten × 2 tens (10 × 20) = 2 hundreds. Write 2 in hundreds place.

$$\boxed{\begin{array}{r} 37 \\ \times\ 20 \\ \hline 00 \\ 74 \\ \hline \end{array}}$$

1. Multiply by writing the zeros as shown in the example in the box:

$$\begin{array}{rrrrrrr} 31 & 24 & 18 & 41 & 28 & 52 & 34 \\ \times\ 30 & \times\ 10 & \times\ 30 & \times\ 10 & \times\ 20 & \times\ 10 & \times\ 20 \\ \hline \end{array}$$

$$\begin{array}{r} 37 \\ \times\ 20 \\ \hline 740 \end{array}$$

2. Multiply by writing a zero right away to show that there are no ones, as shown in this example:

$$\begin{array}{rrrrrrrrrr} 15 & 33 & 19 & 42 & 81 & 31 & 47 & 22 & 54 & 16 \\ \times\ 20 & \times\ 10 & \times\ 20 & \times\ 10 & \times\ 10 & \times\ 20 & \times\ 10 & \times\ 30 & \times\ 10 & \times\ 30 \\ \hline \end{array}$$

Zeros in Multiplication

This is an experiment for you to do all by yourself. Take everything off your desk. Be sure nothing is left on top of it. Not any is written as a 0 in arithmetic.

Think to yourself that you are multiplying not any things that you have on your desk by 6: 6 × 0. Do you see that there are still not any things on your desk? So, 6 × 0 = 0. 6 × 0 means 0 taken six times.

The fifth graders are making a picture book about their trip in the woods. They made a list of the different things they saw. Three of the children are going to draw the pictures on each page. There are going to be 10 pictures on each page to show how the work is done.

There are going to be 23 pages in all. How many pictures must be drawn if there are going to be 10 pictures on each of the 23 pages?

$$\begin{array}{r} 10 \\ \underline{\times\, 23} \\ 30 \\ \underline{20} \\ 230 \end{array}$$

Multiply by 3 ones: 3 ones × 0 = 0. Write 0 in ones place in the answer.

3 × 1 ten = 3 tens. Write 3 in tens place under the line.

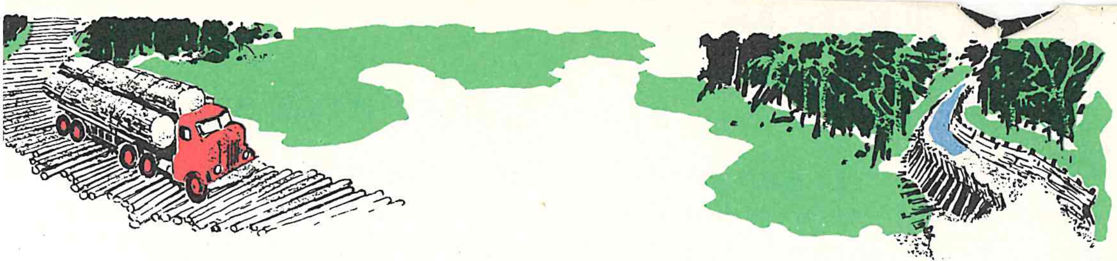
Multiply by 2 tens. 2 tens × 0 (20 × 0) = 0 tens. Write 0 in tens place.

2 tens × 1 ten (20 × 10) = 2 hundreds.

Add to find the answer.

1. Multiply:

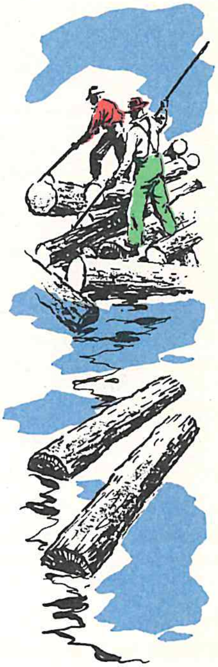
a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
10	30	80	50	40	60	40	10	30	70
× 92	× 24	× 16	× 31	× 25	× 22	× 16	× 17	× 24	× 19



Getting the Logs to the Mill

1. Sometimes logs are taken to the mill by trucks. Tony's father helps keep the logging road repaired. He is helping to build a new road. They are using an average of 62 logs for each of the 10 miles of corduroy road. How many logs is this altogether?

2. Seventeen trucks each carried 10 logs to the mill this morning. If the 17 trucks make 2 trips a day carrying this many logs on each trip, how many logs will be taken to the mill in one day?



3. Henry's father drives a logging truck. The logs were so large he could take only 4 logs each trip. He makes 2 trips a day. How many logs can he haul in 5 days?

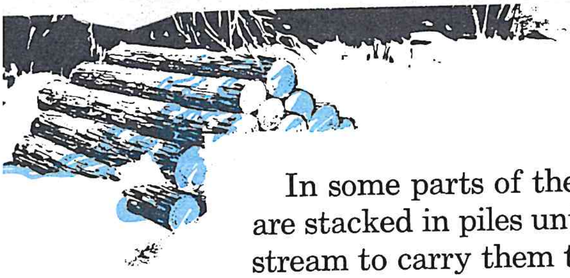
4. Sometimes logs are sent to the mill by chutes that empty them into ponds and streams. The foreman estimated that 98 logs go down those chutes each day in the spring of the year. How many logs would go down the chutes in 10 days?

5. Tony watched the men trying to break up a log jam on the lake. His father estimated that there were 350 logs in the jam. The men worked from 10:15 A.M. until 11:55 A.M. How long did they work on it?

Multiply (use the way that is easiest for you in multiplying by a 0 in the ones place):

	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
6.	12 × 30	17 × 30	31 × 20	16 × 40	36 × 20	41 × 10	57 × 10	42 × 10	19 × 20
7.	34 × 18	19 × 20	26 × 19	57 × 16	45 × 19	30 × 17	50 × 13	20 × 14	48 × 20

Problems and Exercises



More Work with Zeros

In some parts of the United States and in Canada, logs are stacked in piles until there is enough water in a nearby stream to carry them to a mill. Harry saw 20 logs in each of 30 different piles when he went on a trip in the woods with his father. How many logs are there in all 30 piles?

$$\begin{array}{r} 20 \\ \times\ 30 \\ \hline 00 \end{array}$$

Multiply by the 0 (not any) in ones place:

0 × 0 ones = 0 ones (not any of anything gives not any, or 0). Write 0 in ones place under the line.

0 × 2 tens = 0 tens.

Write 0 in tens place under the line.

$$\begin{array}{r} 20 \\ \times\ 30 \\ \hline 00 \\ 60 \\ \hline 600 \end{array}$$

Multiply by the 3 in tens place:

3 tens × 0 ones = 0 tens.

Write 0 in tens place under the line.

3 tens × 2 tens = 6 hundreds.

$$\begin{array}{r} 20 \\ \times\ 30 \\ \hline 0 \end{array}$$

Multiply by the 0 in ones place:

When multiplying by zero in ones place, you can write 0 in only ones place under the line.

Multiply by the 3 in tens place:

$$\begin{array}{r} 20 \\ \times\ 30 \\ \hline 600 \end{array}$$

3 tens × 0 ones = 0 tens.

Write 0 in tens place.

3 tens × 2 tens = 6 hundreds.

Write 6 in hundreds place.

There are 600 logs in 30 piles of this size.

1. Multiply by writing the zeros in all the places when you multiply by zero in ones place:

$$\begin{array}{ccccccccc} \textbf{a.} & \textbf{b.} & \textbf{c.} & \textbf{d.} & \textbf{e.} & \textbf{f.} & \textbf{g.} & \textbf{h.} & \textbf{i.} \\ \begin{array}{r} 10 \\ \times\ 20 \\ \hline \end{array} & \begin{array}{r} 50 \\ \times\ 10 \\ \hline \end{array} & \begin{array}{r} 30 \\ \times\ 30 \\ \hline \end{array} & \begin{array}{r} 60 \\ \times\ 10 \\ \hline \end{array} & \begin{array}{r} 80 \\ \times\ 10 \\ \hline \end{array} & \begin{array}{r} 70 \\ \times\ 10 \\ \hline \end{array} & \begin{array}{r} 40 \\ \times\ 20 \\ \hline \end{array} & \begin{array}{r} 70 \\ \times\ 20 \\ \hline \end{array} & \begin{array}{r} 10 \\ \times\ 30 \\ \hline \end{array} \end{array}$$

2. Multiply by writing 0 only in ones place when you multiply by 0:

$$\begin{array}{ccccccccc} \begin{array}{r} 60 \\ \times\ 10 \\ \hline \end{array} & \begin{array}{r} 80 \\ \times\ 10 \\ \hline \end{array} & \begin{array}{r} 40 \\ \times\ 20 \\ \hline \end{array} & \begin{array}{r} 20 \\ \times\ 30 \\ \hline \end{array} & \begin{array}{r} 30 \\ \times\ 20 \\ \hline \end{array} & \begin{array}{r} 50 \\ \times\ 10 \\ \hline \end{array} & \begin{array}{r} 70 \\ \times\ 10 \\ \hline \end{array} & \begin{array}{r} 90 \\ \times\ 10 \\ \hline \end{array} & \begin{array}{r} 10 \\ \times\ 50 \\ \hline \end{array} \end{array}$$

Zeros in Both Multiplier and Multiplicand

Practice in Multiplication

1. Multiply:

	a.	b.	c.	d.	e.	f.	g.	h.	i.
	40 23	30 17	70 12	20 16	60 11	70 10	80 10	30 13	50 11
2.	26 11	11 13	14 12	12 22	22 23	23 12	44 22	33 10	18 15
3.	46 10	55 10	70 10	25 20	35 20	18 32	28 22	39 12	12 48
4.	18 44	49 15	17 16	54 18	43 15	64 8	99 10	17 40	8 26
5.	39 6	40 30	78 8	16 7	5 17	18 29	17 49	6 46	80 10

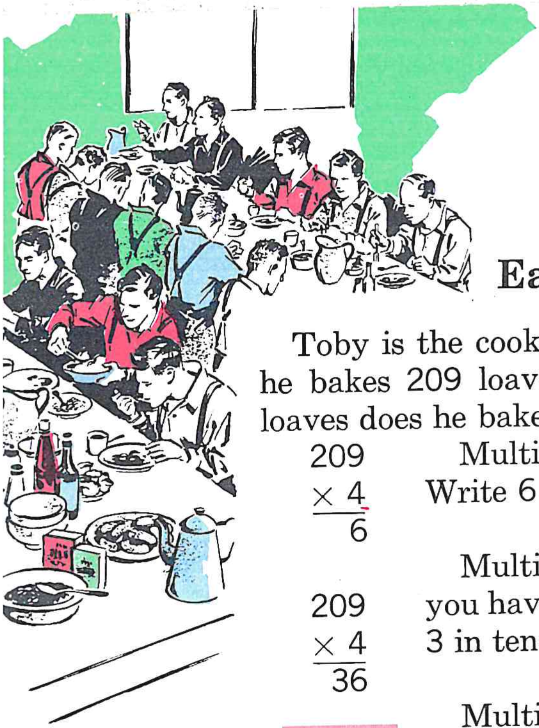
6. Jim and his friends have a hideout deep in the woods. Each of the 8 boys cut 10 pine branches for the roof of the hideout. How many branches do they have for the roof?

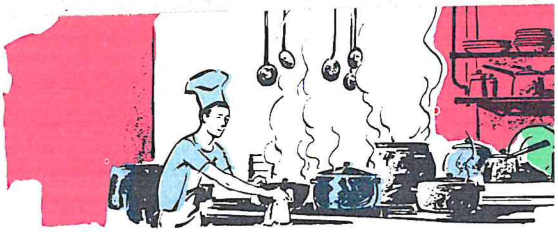
7. Alex's mother is saving tin boxes in which the boys may keep the food, so the beetles and ants will not get it. Alex put 20 crackers in each of 4 boxes. How many crackers are in boxes?

8. The boys are having a fish fry at the hideout. Six boys caught 7 fish apiece, Henry and Mike caught 9 each, and Joe didn't catch any. Find how many fish they have for the fish fry.

9. Larry brought 4 small boxes of raisins for each of the 8 boys. How many boxes did Larry bring?

10. Steven is a good cook, which is a good thing because he is always hungry. He made pancakes for the boys' supper. Five of the boys ate 12 pancakes each. Three of them ate 14 each. Steven ate 15. How many pancakes were eaten?





Eating at the Camp Mess Hall

Toby is the cook at the mess hall. He told Jerry that he bakes 209 loaves of bread every week. How many loaves does he bake in a month?

$$\begin{array}{r} 209 \\ \times\ 4 \\ \hline 6 \end{array}$$

Multiply the ones: 4 × 9 ones = 36 ones. Write 6 in ones place, and hold the 3 tens.

$$\begin{array}{r} 209 \\ \times\ 4 \\ \hline 36 \end{array}$$

Multiply the tens: 4 × 0 tens = 0 tens, but you have 3 tens you held from 36 ones. Write 3 in tens place.

$$\begin{array}{r} 209 \\ \times\ 4 \\ \hline 836 \end{array}$$

Multiply the hundreds: 4 × 2 hundreds = 8 hundreds. Write 8 in hundreds place. The answer is 836.

1. Toby made 109 cookies yesterday. If he made this many cookies each week, how many would he make in a month?

2. Multiply:

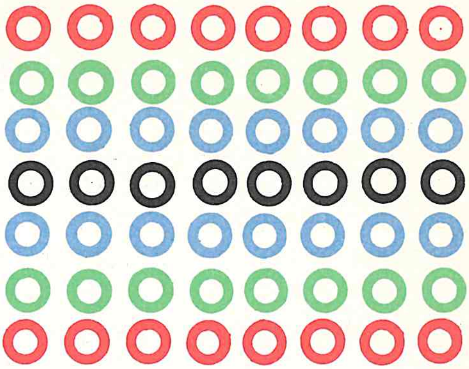
a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
106	207	101	504	106	308	102	109
× 6	× 4	× 7	× 1	× 8	× 3	× 8	× 7

3. Toby buys food in large amounts. He bought 10 cases of peas. Each case has 24 cans. How many cans of peas does he have?

4. The loggers like Toby's pancakes. Toby made 4 pancakes for each of the 32 loggers this morning. Find how many he made in all.

5. Toby's 2 helpers helped him fry 8 dozen sausages today. How many sausages did they fry?

A Zero in Tens Place in the Multiplicand



Checking Multiplication

Look at this picture. Are there seven rows of 8 each, or eight rows of 7 each? Which of these two ways would you write the multiplication?

$$\begin{array}{r} 8 \\ \times 7 \\ \hline \end{array} \quad \text{or} \quad \begin{array}{r} 7 \\ \times 8 \\ \hline \end{array}$$

The number in a group (or the number in a row, as in the problem above) is written first.

The times you are using this number is the number by which you multiply.

8 things in each row
× 7 rows

Tell why you can exchange the numbers in a multiplication exercise.

1. Write these multiplication problems to show which number should be written first:

a. Find the cost of thirty-six 3-cent stamps.

b. How many bananas are there in 6 bunches, if there are 12 bananas in each bunch?

c. Draw a picture showing 6 marbles in a circle. Find how many marbles there would be in 8 circles like this, if each circle had this many marbles. Write the problem, and work it.

Do you see that we get the same answer no matter which number is written first? To prove this, write the exercise both ways and multiply:

$$\begin{array}{r} 48 \\ \times 20 \\ \hline \end{array} \quad \begin{array}{r} 20 \\ \times 48 \\ \hline \end{array}$$

Which of these two ways is easier for you?

A good way to check a multiplication is to multiply with the numbers exchanged.

2. Multiply and check:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**	**j.**
18	26	20	36	40	37	26	37	10	39
× 7	× 13	× 15	× 10	× 20	× 18	× 19	× 7	× 19	× 14

Unit Review

1. Multiply:

	a.	b.	c.	d.	e.	f.	g.
	38	27	16	19	27	56	84
	× 8	× 4	× 8	× 5	× 8	× 9	× 4
2.	118	214	316	715	297	477	591
	× 6	× 3	× 3	× 1	× 3	× 2	× 1
3.	$1.40	$2.60	$4.17	$1.19	$2.03	$3.00	$1.28
	× 8	× 3	× 4	× 7	× 6	× 9	× 7

4. Multiply in the way that you think is the shorter, and tell why you think it is shorter:

$$\begin{array}{r} 37 \\ \times\ 20 \\ \hline \end{array}$$

5. Make addition problems to prove that your answer to each of these is right:

a. 3 tens × 2 tens = 600

b. 7 tens × 5 ones = 35 tens

6. Tell why each of these multiplications at the right is correct:

$$\begin{array}{r} 17 \\ \times\ 23 \\ \hline 51 \\ 340 \\ \hline 391 \end{array} \qquad \begin{array}{r} 17 \\ \times\ 23 \\ \hline 51 \\ 34 \\ \hline 391 \end{array}$$

7. Do these by addition and then by multiplication:

a.	b.	c.	d.	e.	f.	g.	h.
26	139	18	38	41	15	80	19
× 7	× 3	× 7	× 4	× 8	× 6	× 5	× 6

8. See how quickly you can give the answers to these:

8	5	6	5	6	7	9	7
× 9	× 9	× 5	× 9	× 9	× 6	× 3	× 7
4	4	9	4	9	3	8	5
× 9	× 7	× 5	× 8	× 6	× 9	× 6	× 4

Unit Test

1. Billy is a camera fan. He takes many pictures of things in Brookdale and in the woods. He took 36 pictures on each of the last 8 Saturdays. Find how many pictures he took on all of these days.

2. Billy likes to take pictures of different kinds of trees. He has 10 pictures with 16 different trees in each picture. How many trees are in all 10 pictures?

3. Sam takes pictures, too. He took 3 different shots of each of the 9 crews of men working in Happy Valley. How many pictures did he take in all?

4. There are 45 pages in Billy's new picture album. How many pictures will he have if he puts 12 pictures on each page?

5. The two boys took 10 pictures with a group of 20 different children in each picture. Find the number of children in the 10 pictures.

6. Multiply:

$$\begin{array}{rrrrrrrr} 126 & 131 & 214 & 125 & 18 & 54 & 12 & 17 \\ \times 4 & \times 7 & \times 3 & \times 6 & \times 27 & \times 16 & \times 34 & \times 29 \\ \hline \end{array}$$

7. Check these multiplications by exchanging the numbers:

$$\begin{array}{rrrrrrrr} 15 & 8 & 17 & 30 & 14 & 20 & 41 & 9 \\ \times 16 & \times 12 & \times 27 & \times 10 & \times 30 & \times 8 & \times 18 & \times 50 \\ \hline \end{array}$$

8. Write the multiplication facts for the 4's and the 7's.

9. Finish these exercises:

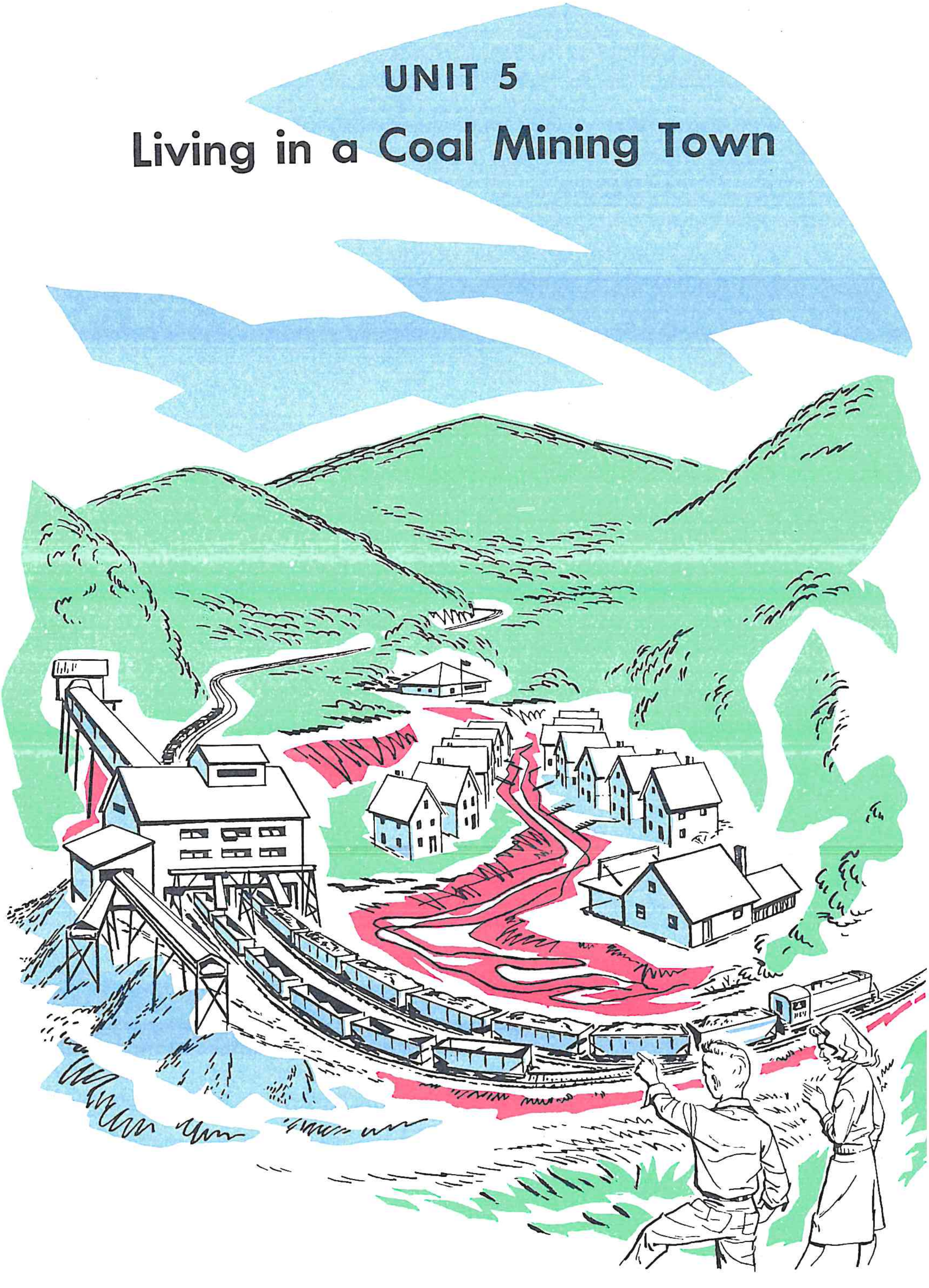
$$\begin{array}{rrrrrrrr} 49 & 62 & 14 & 17 & 38 & 15 & 27 & 19 \\ \times 10 & \times 9 & \times 30 & \times 16 & \times 20 & \times 5 & \times 7 & \times 40 \\ \hline 4\;\;0 & 5 & 2 & 0 & 76 & 5 & 1 & 7 \\ & & & 1 & & & & \\ \cline{4-4} \end{array}$$

10. Multiply:

$$\begin{array}{rrrrrrrr} 106 & 14 & 8 & 22 & 128 & 40 & 18 & 43 \\ \times 7 & \times 30 & \times 15 & \times 7 & \times 6 & \times 20 & \times 20 & \times 19 \\ \hline \end{array}$$

UNIT 5

Living in a Coal Mining Town



Tony and Marie like to look at their town from the top of the hill. Then they can see all of it at once. They can tell which house is theirs, even though you probably think they look exactly alike. All the houses, the store, the postoffice, and the other buildings are owned by the coal company.

The tipple is the tallest building in town. Cables bring coal cars to the top of the tipple. Then the coal moves along a conveyor belt until it drops into railroad cars below. It is already sorted according to the size of the lumps. How do you suppose this sorting is done?

Would you like to go into a mine? You go down in an elevator in some of the mines. In others, you ride into a tunnel in the side of a hill in a coal car. Whichever way you go, you will be wearing a hard miner's hat with a lamp on the front of it. You will need some food because you might be in the mine 7 or 8 hours.

You will not have to worry about fresh air in the mine. Large fans send air into the mine all the time. Large timbers hold up the tops of the tunnels and keep the walls from caving in. Electric lights in the mine help you to see where you are going, but you will be glad you have a lamp on the front of your hat.

Let's see if we can think of some uses we would have for numbers if we lived in a mining town.

1. How would we use numbers if we bought coal to heat our homes?

2. Tell how we would need numbers if we went to the company store.

3. Suppose you are the Superintendent of the Mines. How would you use numbers?

4. How does a miner use numbers when he gets his pay check?

Walking Home with Their Father

Tony and Marie heard the 4 o'clock whistle from the top of the hill. They knew it would take them 10 minutes of fast walking and running to reach the mine shaft and walk home with their father.

Their father came up in the elevator with the last group of men. There are 48 men working in the mine on this shift. Eight men come up in each elevator load. How many trips must the elevator make?

Tony figured it this way:

$$\begin{array}{r} 6 \\ 8\overline{)48} \\ \underline{48} \end{array}$$

How many 8's in 48?

Tony remembered that there are six 8's in 48.

Your multiplication facts will help you.

Marie figured it this way:

$$\begin{array}{rl} 48 & \\ \underline{-\ 8} & —1 \\ 40 & \\ \underline{-\ 8} & —1 \\ 32 & \\ \underline{-\ 8} & —1 \\ 24 & \\ \underline{-\ 8} & —1 \\ 16 & \end{array}$$

and so on

How many 8's in 48?

Marie subtracted 8 each time until she had none left.

She kept tally and found that she had subtracted 6 times. Then she knew there were six 8's in 48.

1. Find these division facts by subtraction:

a.	b.	c.	d.	e.	f.
$9\overline{)63}$	$7\overline{)42}$	$8\overline{)32}$	$9\overline{)27}$	$8\overline{)64}$	$9\overline{)81}$

Give the answers to these at sight. Use subtraction to find any which you do not know at once, then learn them:

2. $9\overline{)9}$ $6\overline{)54}$ $7\overline{)7}$ $8\overline{)48}$ $5\overline{)10}$ $3\overline{)12}$

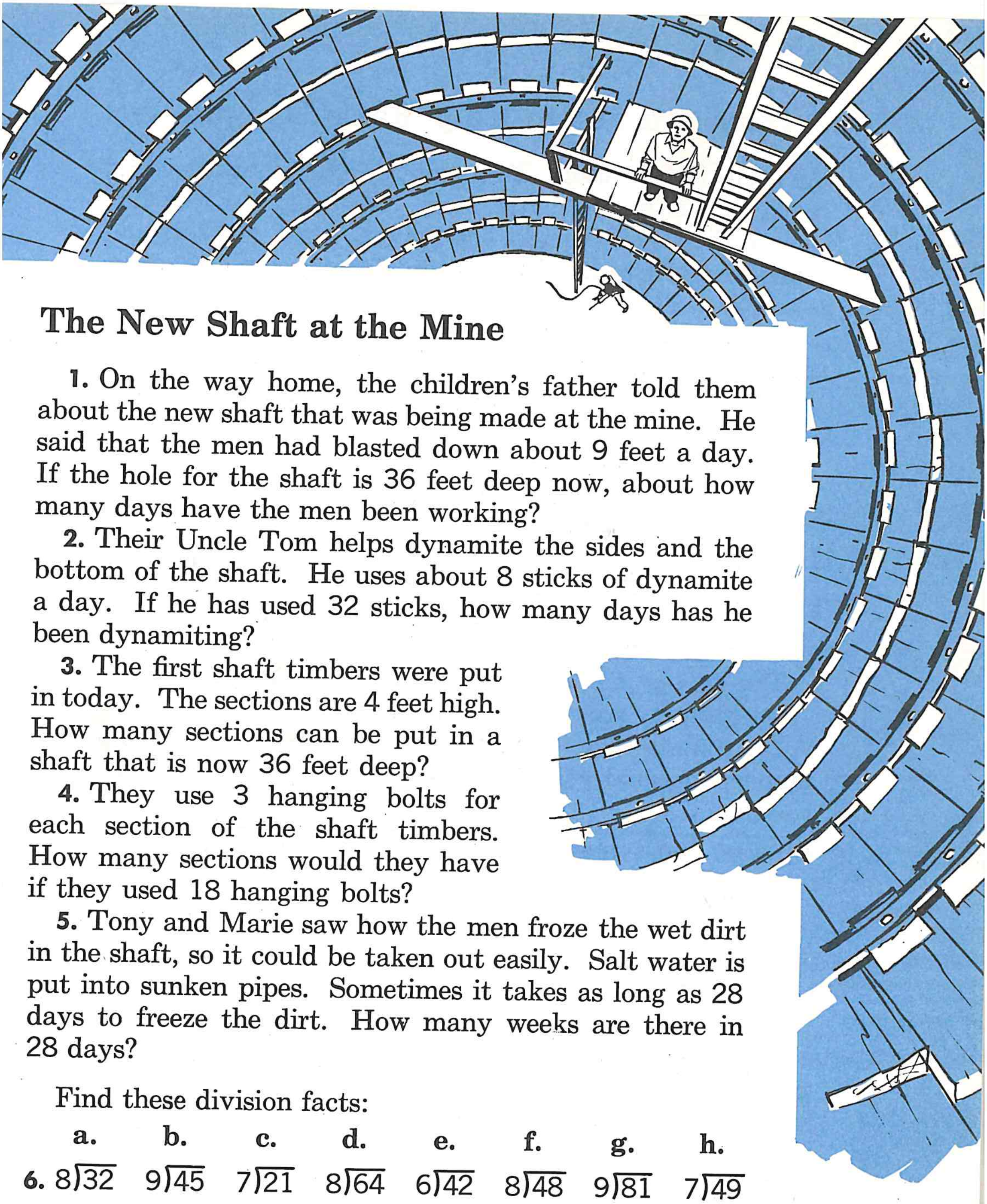
3. $2\overline{)14}$ $5\overline{)5}$ $6\overline{)48}$ $8\overline{)56}$ $3\overline{)9}$ $7\overline{)49}$

4. $2\overline{)4}$ $8\overline{)8}$ $3\overline{)6}$ $6\overline{)42}$ $5\overline{)15}$ $7\overline{)56}$

5. $5\overline{)20}$ $4\overline{)4}$ $8\overline{)16}$ $6\overline{)36}$ $7\overline{)63}$ $4\overline{)32}$

6. $2\overline{)6}$ $4\overline{)8}$ $2\overline{)2}$ $8\overline{)24}$ $7\overline{)35}$ $6\overline{)30}$

7. $5\overline{)25}$ $9\overline{)63}$ $7\overline{)28}$ $8\overline{)64}$ $4\overline{)12}$ $6\overline{)24}$



The New Shaft at the Mine

1. On the way home, the children's father told them about the new shaft that was being made at the mine. He said that the men had blasted down about 9 feet a day. If the hole for the shaft is 36 feet deep now, about how many days have the men been working?

2. Their Uncle Tom helps dynamite the sides and the bottom of the shaft. He uses about 8 sticks of dynamite a day. If he has used 32 sticks, how many days has he been dynamiting?

3. The first shaft timbers were put in today. The sections are 4 feet high. How many sections can be put in a shaft that is now 36 feet deep?

4. They use 3 hanging bolts for each section of the shaft timbers. How many sections would they have if they used 18 hanging bolts?

5. Tony and Marie saw how the men froze the wet dirt in the shaft, so it could be taken out easily. Salt water is put into sunken pipes. Sometimes it takes as long as 28 days to freeze the dirt. How many weeks are there in 28 days?

Find these division facts:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
6.	$8\overline{)32}$	$9\overline{)45}$	$7\overline{)21}$	$8\overline{)64}$	$6\overline{)42}$	$8\overline{)48}$	$9\overline{)81}$	$7\overline{)49}$
7.	$4\overline{)36}$	$5\overline{)40}$	$6\overline{)36}$	$7\overline{)42}$	$8\overline{)40}$	$9\overline{)27}$	$9\overline{)36}$	$6\overline{)48}$

Problems and Exercises Using Division Facts

Tony and Marie Help Make Doughnuts

Their father asked Tony and Marie what they did while he was at work in the mine. They told him they had helped their mother make doughnuts. Most of the doughnuts are going to be given to three nearby families where someone is ill.

They helped their mother make 84 doughnuts in all. If they divide the doughnuts equally among their own family and 3 other families, how many doughnuts did each family receive?

The whole is 84 doughnuts.

The number of parts they were divided into is 4.

What is the size of each part?

$4\overline{)84\text{ doughnuts}}$ $\qquad$ $4\overline{)84} = 4\overline{)8\text{ tens and }4\text{ ones}}$

$$\begin{array}{r} \text{2 tens and 1 one} = ? \\ 4\overline{)84} = 4\overline{)8\text{ tens and }4\text{ ones}} \end{array}$$

The answer is 2 tens and 1 one, or 21. Why?

Each family received 21 doughnuts.

Do you see that the tens and ones were divided into a number of equal parts? Try it with your tens and ones counters:

$4\overline{)8\text{ tens and }4\text{ ones}} = 4\overline{)\square\square\square\square\square\square\square\square \;\; |\,|\,|\,|} = ?$

In this problem you knew the whole, and you knew how many parts you must find in the whole. You had to find the size of the part.

1. Divide to find the equal parts (label your answer):

a. 15 apples divided equally among 5 children.

b. 24 peppermint sticks divided equally between 2 children.

2. Divide the tens and ones into equal parts:

$$\begin{array}{r} \text{1 ten and 2 ones} = ? \\ \textbf{a. } 3\overline{)3\text{ tens and }6\text{ ones}} \end{array} \qquad \textbf{b. } 4\overline{)4\text{ tens and }8\text{ ones}}$$

$$\textbf{c. } 5\overline{)5\text{ tens and }5\text{ ones}} \qquad \textbf{d. } 2\overline{)8\text{ tens and }6\text{ ones}}$$

Tony and Marie Divide Box Tops

Tony and Marie did the dishes after supper, while their father read the paper and their mother mended the hole in Tony's red wool sock. Then they got out the cereal box tops they had been saving for a long time and divided them. They counted them first to see how many box tops there were in all. There were 34. They decided to divide them into 2 equal parts.

Marie figured it this way:

$$2\overline{)34} = 2\overline{)\text{3 tens and 4 ones}}$$

Three tens cannot be divided equally into 2 parts, so I will use only 2 tens. I will put the other ten with my ones right now before I begin dividing.

$$2\overline{)34} = 2\overline{)\text{2 tens and 14 ones}}$$

Now I am ready to divide.

$$\begin{array}{rl} & \text{1 ten and 7 ones} = \text{17 box tops} \\ 2 & \overline{)\text{2 tens and 14 ones}} \\ & \underline{\text{2 tens}} \\ & \qquad\qquad \text{14 ones} \\ & \qquad\qquad \underline{\text{14 ones}} \end{array}$$

I can divide 2 tens into 2 equal parts. I will write 1 in tens place in the answer.

I have 14 ones to be divided. 14 ones divided into 2 equal parts = 7 ones in each part. I will write 7 in ones place in the answer.

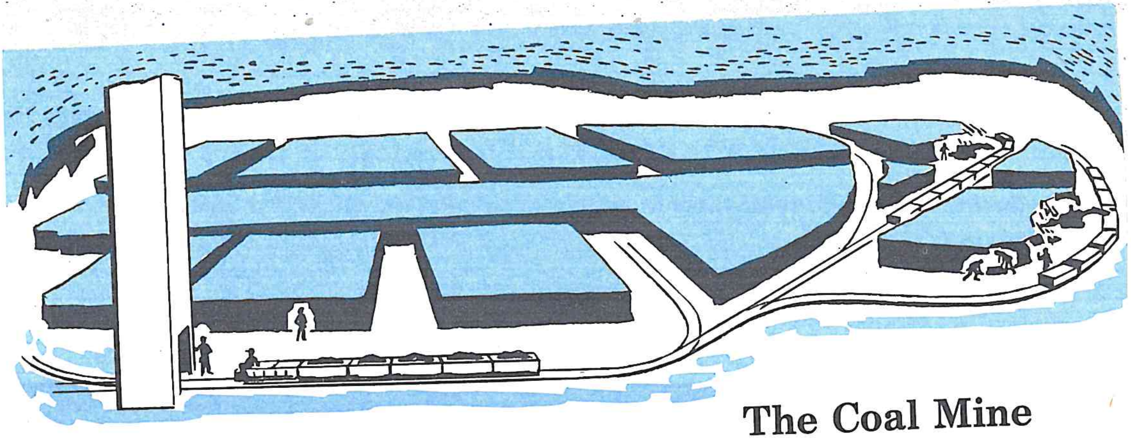
Use as many tens as can be divided evenly, and change the remaining tens to ones before you divide as Marie did:

1. Divide 58 doughnuts equally between 2 families.

2. Divide 4 dozen rolls equally among 3 people.

3. If you have 4 friends among whom you want to divide 36 box tops equally, how many would each friend receive?

4. Divide: **a.** $3\overline{)66}$ **b.** $5\overline{)75}$ **c.** $4\overline{)32}$ **d.** $6\overline{)72}$ **e.** $8\overline{)96}$ **f.** $3\overline{)51}$ **g.** $7\overline{)84}$



The Coal Mine

This is the drawing Tony and Marie's father made for them. It shows how the inside of the mine would look if the ground and rock on top were taken off.

Tony's uncle set 45 posts in place in 3 days. These were used to keep the roof of the tunnel from caving in. How many posts did he set each day, if he set an equal number on each of the 3 days?

$$3\overline{)45} = 3\overline{)4 \text{ tens and } 5 \text{ ones}} = 3\overline{)\square\square\square\square\ |||||} = 3\overline{)\square\square\square\ \cancel{||||||||||}\ |||||}$$

$$\begin{array}{ll} & 1 \text{ ten and ? ones} \\ 3\overline{)} & 4 \text{ tens and } 5 \text{ ones} \\ & \underline{3 \text{ tens}} \\ & 1 \text{ ten} \end{array}$$

He uses 3 of the 4 tens to make a group of 3 tens. 3 tens divided into 3 equal parts gives 1 ten in each part. Write 3 under the 4 tens to show that you have used them. There is 1 ten left unused.

$$\begin{array}{lll} & 1 \text{ ten} & \text{and } 5 \text{ ones} \\ 3\overline{)} & 4 \text{ tens} & \text{and } 5 \text{ ones} \\ & \underline{3 \text{ tens}} & \\ & 1 \text{ ten} & \text{and } 5 \text{ ones} \\ & & \text{or} \\ & & 15 \text{ ones} \\ & & \underline{15 \text{ ones}} \end{array}$$

The 1 ten that is left and the 5 ones = 15 ones. 15 ones divided into 3 equal parts gives 5 in each part. Write 5 in ones place in the answer. Write 15 under the 15 ones to show that you have used them. There are no ones left.

Divide, writing the tens and ones:

1. $3\overline{)48}$ $2\overline{)32}$ $4\overline{)56}$ $2\overline{)38}$ $4\overline{)96}$ $7\overline{)84}$ $5\overline{)65}$

2. $2\overline{)58}$ $4\overline{)52}$ $2\overline{)52}$ $8\overline{)96}$ $4\overline{)64}$ $3\overline{)45}$ $2\overline{)36}$

Thinking Tens and Ones in Finding Equal Parts

Tony wants to know how many pieces he would have left if he gave a friend half of his 46 pieces of candy. He has an idea that he can find the answer by thinking tens and ones in the division (46 ÷ 2) instead of writing them. Look at his work:

$$\begin{array}{r} 2 \\ 2\overline{)46} \\ \underline{4} \end{array}$$

Half of 46 means that one of 2 equal parts is to be found. 46 is 4 tens and 6 ones. Is the answer as much as 20? as much as 30?

The tens should be divided first. Why? 4 tens divided into 2 equal parts gives 2 tens in each part. Write 2 in tens place in the answer. Also, write 4 under the 4 tens in 46. Why?

$$\begin{array}{r} 23 \\ 2\overline{)46} \\ \underline{4} \\ 6 \\ \underline{6} \end{array}$$

There are 6 ones yet to be divided. (See where the 6 is written.) 6 ones divided into 2 equal parts gives 3 ones in each part. What numbers do you write? Why?

The answer is: Tony and his friend will each have 23 pieces of candy.

Divide:

	a.	b.	c.	d.	e.	f.	g.	h.
1.	$4\overline{)48}$	$4\overline{)92}$	$3\overline{)48}$	$3\overline{)75}$	$3\overline{)78}$	$4\overline{)56}$	$3\overline{)84}$	$2\overline{)30}$
2.	$6\overline{)94}$	$7\overline{)84}$	$7\overline{)98}$	$5\overline{)80}$	$5\overline{)85}$	$4\overline{)64}$	$6\overline{)90}$	$4\overline{)52}$
3.	$8\overline{)96}$	$9\overline{)99}$	$2\overline{)58}$	$2\overline{)76}$	$4\overline{)60}$	$2\overline{)78}$	$3\overline{)71}$	$2\overline{)36}$

4. Tony and Marie want to divide 48 pennies equally between them. How many pennies will each get?

5. Marie is going to spend half of her pennies for a new hair ribbon and save the rest. What does she plan to pay for the ribbon?

6. There are 36 children in Marie's room at school. Half of them are boys. How many boys are there?

7. The 36 children in Marie's room were divided into 3 teams with an equal number on each team. How many children were on each team?

Sending for Decals

1. Tony asked his mother if she would help him send for some free decals with the 69 box tops he has saved. He gets a free decal for every 3 box tops. How many free decals can he get?

$$\begin{array}{l} \text{? groups of 3 box tops} = \text{? decals.} \\ 3\text{ box tops}\overline{)69\text{ box tops}} \\ 3\overline{)6\text{ tens and }9\text{ ones}} \end{array}$$

You want to know how many groups of 3 ones there are in 6 tens (60 ones).

You first write the division as follows to see what it means:

$$\begin{array}{l} \underline{20\text{ ones and }3\text{ ones}} = 23\text{ groups} \\ 3\text{ ones}\overline{)60\text{ ones and }9\text{ ones}} \end{array}$$

$$\begin{array}{r@{}l} & \underline{2\text{ tens and }3\text{ ones}} = 23 \\ 3 & \overline{)6\text{ tens and }9\text{ ones}} \\ & \underline{6\text{ tens}} \\ & \qquad\qquad 9\text{ ones} \\ & \qquad\qquad \underline{9\text{ ones}} \end{array}$$

Do you see that 6 tens = 60 ones? If you find the number of groups of 3 ones in 60 ones, it is 20 or 2 tens.

Let's think the division as 6 tens ÷ 3 ones = ? (How many 3's are there in 6 tens?) You see that the answer is 2 tens.

Then, 9 ones ÷ 3 ones = 3. Write 3 in ones place in the answer.

2. Marie has 45 box tops. How many decals can she get for her box tops?

$$\begin{array}{r@{}l} & 1 \\ 3 & \overline{)45} \\ & \underline{3} \\ & 1 \end{array}$$

Marie thinks tens and ones as she divides: 4 tens ÷ 3 = ? It does not divide evenly. She can use 3 of the 4 tens. She thinks: How many groups of 3 ones are there in 3 tens (30 ones)?

Finish the division.

3. Divide by thinking how many groups:

$3\overline{)51}$ $4\overline{)74}$ $8\overline{)96}$ $2\overline{)56}$ $3\overline{)84}$ $2\overline{)46}$ $7\overline{)84}$ $2\overline{)58}$

The Fans on the Hill

Today is Saturday. As soon as Tony finishes his work, he walks to the top of the hill to look at the fans once more. He likes these fans because they carry fresh air into the mine where his father works. He falls asleep at night listening to the hum of the fan.

A large fan keeps going day and night. Another fan is kept as a spare and is used if something happens to the first fan, or if it is being oiled and repaired.

Automatic doors open and shut down in the mine, sending fresh air where it is needed. In grandfather's day, a boy used to open and shut these doors. He was called a trapper.

1. Tony's grandfather used to be a trapper when he was just a little older than Tony. He worked 54 hours a week. How many 9-hour working days did he work each week? (You are finding how many groups of 9 there are in 54.)

2. Grandfather used to be paid in scrip part of the time. This is like paper money, and he could buy things with it at the company store. How many $3.00 pieces of scrip could he get for the $21.00 he earned? (You are finding how many groups of 3 there are in 21.)

3. Do you know how many 8's there are in 72? If you do not, you can find out by using parts. Can you use either of these ways of showing parts in 72?

$8\overline{)72} = 8\overline{)7 \text{ tens and } 2 \text{ ones}}$ or $8\overline{)72} = 8\overline{)70 \text{ ones and } 2 \text{ ones}}$

a. Find parts of 72 in which you know the number of 8's. Do you know how many 8's there are in 40? 40 is part of 72, so subtract 40 from 72 to find the other part.

$8\overline{)40 + 32}$ Finish the work.

b. Of course, you know that you can find the answer by subtracting 8's: $72 - 8 = 64$, $64 - 8 = 56$, and so on. The number of times you subtract will tell you how many 8's there are.

Using Parts of a Number in Division

The Old Way of Mining Coal

When Tony and Marie's father was 18 years old, he used a pick to cut a line near the bottom of the wall of coal. He did this so that the coal would be loosened and more could be torn away when it was dynamited.

Then he used a long drill to put holes in the side of the wall for the sticks of dynamite.

After the dynamite had torn the coal loose, their father loaded it into little cars to be taken out of the mine.

1. Each miner can dig 9 tons in a 12-hour shift. If 81 tons of coal are mined in a day, how many men are working?

2. Pete was the powderman who "set off" the dynamite. He usually used 3 sticks for each hole. If he had used 27 sticks, how many places had he dynamited?

3. It took 9 minutes for a miner to fill a small coal car. How many coal cars could he fill in an hour?

Divide:

	a.	b.	c.	d.	e.	f.	g.	h.
4.	$2\overline{)38}$	$3\overline{)42}$	$7\overline{)84}$	$5\overline{)65}$	$5\overline{)55}$	$6\overline{)72}$	$4\overline{)56}$	$4\overline{)68}$
5.	$2\overline{)32}$	$5\overline{)75}$	$3\overline{)51}$	$4\overline{)52}$	$3\overline{)45}$	$2\overline{)36}$	$6\overline{)84}$	$7\overline{)91}$
6.	$4\overline{)64}$	$7\overline{)77}$	$2\overline{)44}$	$2\overline{)48}$	$3\overline{)57}$	$2\overline{)42}$	$6\overline{)90}$	$3\overline{)78}$

The Way Coal Is Mined Today

Today machines do much of the work, especially in the larger mines. A machine cuts a line along the bottom of the wall of coal. Compressed-air drills make the holes for the dynamite. A machine loads the coal into cars very fast.

1. A man can mine 84 tons of coal with the machines in a 7-hour shift. A man working by hand could mine only 7 tons in the same length of time. How many times greater is the number of tons of coal that can be mined by machines than by hand?

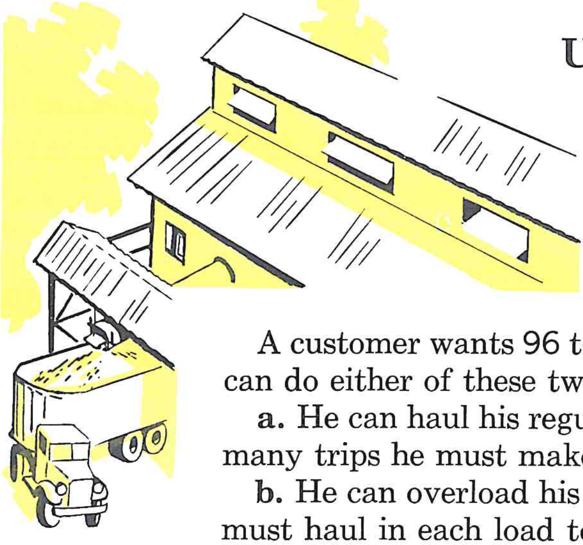
2. It used to take Tony's father 12 minutes to drill a hole for the dynamite. Now a compressed air drill can drill a hole in 1 minute. How many times faster can a compressed air drill do the work?

3. A loading machine can load a car in 1 minute. It would take a man with a shovel about 9 minutes to load a car. How many times faster can a machine do the work?

Divide:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**
4.	$4\overline{)88}$	$5\overline{)55}$	$6\overline{)78}$	$5\overline{)95}$	$7\overline{)98}$	$5\overline{)85}$	$2\overline{)58}$	$5\overline{)80}$
5.	$3\overline{)54}$	$5\overline{)65}$	$2\overline{)58}$	$4\overline{)68}$	$3\overline{)57}$	$2\overline{)76}$	$2\overline{)38}$	$4\overline{)64}$
6.	$7\overline{)84}$	$2\overline{)54}$	$7\overline{)91}$	$3\overline{)45}$	$5\overline{)75}$	$3\overline{)54}$	$6\overline{)78}$	$6\overline{)66}$
7.	$6\overline{)84}$	$2\overline{)36}$	$2\overline{)92}$	$4\overline{)72}$	$8\overline{)88}$	$8\overline{)96}$	$3\overline{)78}$	$2\overline{)62}$

Practice in Division



Using One Way to Divide

Mr. Krone is a trucker. He hauls coal from the mines to his customers. He finds that there are the two kinds of division problems in his business.

A customer wants 96 tons of coal. Mr. Krone knows he can do either of these two things:

a. He can haul his regular load of 8 tons and figure how many trips he must make.

b. He can overload his truck and see how many tons he must haul in each load to deliver the coal in 8 trips.

If Mr. Krone does the first of these two things (a), he divides 96 tons by 8 tons to find the number of trips.

$$\begin{array}{r} 12 \text{ trips} \\ 8\overline{)96} \\ \underline{8} \\ 16 \\ \underline{16} \end{array}$$

You have done this kind of division by thinking: 9 tens ÷ 8 ones (or how many 8's are there in 9 tens?). You can use 8 tens (or 80 ones) of the 9 tens. How many 8's are there in 8 tens? Do you see that the answer is 1 ten?

Finish the work.

If Mr. Krone does the second of these two things (b), he will divide to see how many tons he must haul on each load. He is dividing 96 into 8 equal parts.

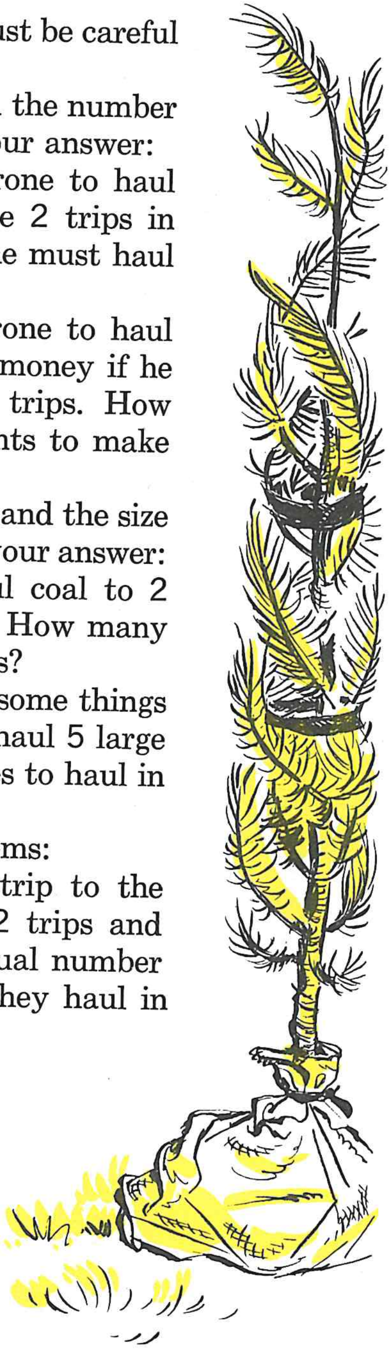
$$\begin{array}{r} 12 \text{ tons} \\ 8\overline{)96} \\ \underline{8} \\ 16 \\ \underline{16} \end{array}$$

You cannot divide 9 tens into 8 equal parts. If you use 8 tens, you get 1 ten in each equal part (8 tens ÷ 8 = 1 ten). Finish the work.

Do you see that you can think the same way in (b) that you did in (a)? That is, you think how many 8's there are in 9 tens. Is the answer 1 ten in both problems? You did the rest of the division work the same way in both problems, so you have one way of doing division. It is called the **general method**.

General Method of Division

Using the One General Method of Division



In using the one method of division, you must be careful to think what the problem means.

In these problems, you know the whole and the number of parts. Find the size of one part. Label your answer:

1. The foreman of the mine hired Mr. Krone to haul 54 rolls of wire. Mr. Krone wants to make 2 trips in hauling this amount. Find how many rolls he must haul on each trip.

2. The next day a customer hired Mr. Krone to haul 92 tons of coal. Mr. Krone can make more money if he uses his larger truck and can haul all of it in 4 trips. How many tons must he haul each trip, if he wants to make only 4 trips?

In the problems below, you know the whole and the size of one part. Find the number of parts. Label your answer:

3. Mr. Krone uses a smaller truck to haul coal to 2 schools in town. He hauls 3 tons each trip. How many trips must he make in order to deliver 87 tons?

4. Mr. Krone uses this smaller truck to haul some things from the city to the company store. He can haul 5 large boxes of groceries in one trip. He has 65 boxes to haul in all. How many trips must he make?

Be sure to label your answer in these problems:

5. Tony's father and Mr. Krone made a trip to the mountains to get aspen poles. They made 2 trips and hauled 44 aspen poles. If they hauled an equal number in each of the 2 trips, how many poles did they haul in each trip?

6. The forest ranger told them which fir saplings could be removed from the forest. They could bring 7 saplings each trip. How many trips must they make to haul 84 saplings to be planted along the streets of the town?

Remainders in Division

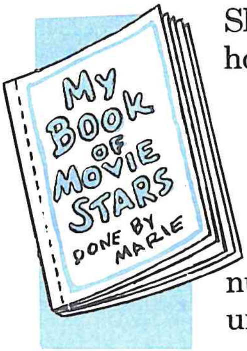
$$\begin{array}{r} 16 \\ 6\overline{)98} \\ 6 \\ \hline 38 \\ 36 \\ \hline 2\ \text{R} \end{array}$$

9 tens divided by 6 = ? (How many 6's in 9 tens?) You see that there is 1 ten. Write 6 tens below 9 tens to show that you used 6 of them. 3 tens have not been used.

3 tens and 8 ones = 38 ones yet to be divided. How many 6's are there in 38? Six 6's are 36. Write 36 below the 38 ones to show that you used 36 of them. You have 2 ones left over. Write R beside the 2 to show that there are 2 ones remaining. You know that this 2 is called a **remainder** in division.

Divide and write R beside the ones which you have left:

	a.	b.	c.	d.	e.	f.	g.	h.
1.	$5\overline{)37}$	$4\overline{)69}$	$2\overline{)79}$	$3\overline{)64}$	$7\overline{)83}$	$6\overline{)99}$	$4\overline{)67}$	$3\overline{)46}$
2.	$7\overline{)88}$	$8\overline{)95}$	$5\overline{)67}$	$4\overline{)74}$	$6\overline{)73}$	$8\overline{)99}$	$2\overline{)81}$	$3\overline{)76}$
3.	$7\overline{)79}$	$4\overline{)79}$	$6\overline{)77}$	$4\overline{)85}$	$3\overline{)81}$	$9\overline{)99}$	$8\overline{)97}$	$9\overline{)86}$
4.	$3\overline{)86}$	$7\overline{)86}$	$4\overline{)93}$	$6\overline{)84}$	$9\overline{)46}$	$5\overline{)74}$	$9\overline{)77}$	$5\overline{)82}$


MY BOOK OF MOVIE STARS
DONE BY MARIE

Marie always does the same thing every rainy day. She works on her scrapbooks. She has a scrapbook of horses, one of movie stars, and one for her own drawings.

Marie makes her own scrapbooks out of wrapping paper. She uses the sewing machine to sew the pages along the fold.

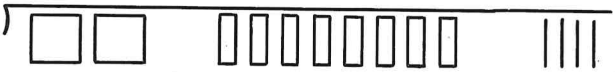
1. Marie has 67 dog pictures. If she puts an equal number on 9 pages, how many will she have left that are unused?

2. Marie has 63 pictures of horses. Can they be divided equally so that she can give half of them to her brother? If they cannot, what remainder will she have?

Tons of Coal

Marie's uncle told her that they had mined 284 tons of coal in 2 days. He said they had mined an equal number of tons each day. Then he asked Marie if she could figure out how many tons they had mined for each of the 2 days.

Marie thought to herself: I'll divide the hundreds, then the tens, and then the ones into 2 equal parts.

$2\overline{)284} = 2)$ 

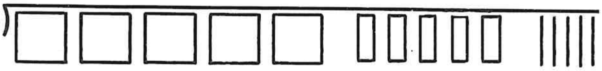
Marie then wrote the hundreds, tens, and ones for the work:

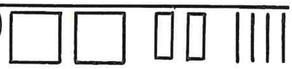
$$\begin{array}{rllll} & 1\text{ hundred} & + 4\text{ tens} & + 2\text{ ones} & = 142\text{ tons}\\ 2\overline{)284} = 2 & \overline{)2\text{ hundreds}} & \overline{+ 8\text{ tens}} & \overline{+ 4\text{ ones}} & \\ & \underline{2\text{ hundreds}} & & & \\ & & 8\text{ tens} & & \\ & & \underline{8\text{ tens}} & & \\ & & & 4\text{ ones} & \\ & & & \underline{4\text{ ones}} & \end{array}$$

Marie knew she had to be right, or Uncle Bill would tease her forever. So she thought to herself that if there are 142 tons for each of the 2 days, then 142 tons + 142 tons should make 284 tons. Is Marie's answer of 142 tons correct?

$$\begin{array}{r} 142\text{ tons}\\ +\ 142\text{ tons}\\ \hline 284\text{ tons}\end{array}$$

1. Divide:

a. 5) 

b. 2) 

2. Divide:

a. $6\overline{)6\text{ hundreds} + 6\text{ tens} + 6\text{ ones}}$

b. $2\overline{)2\text{ hundreds} + 8\text{ tens} + 6\text{ ones}}$

3. Divide, writing the hundreds, tens, and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**
$2\overline{)246}$	$3\overline{)633}$	$4\overline{)488}$	$5\overline{)555}$	$3\overline{)336}$	$2\overline{)668}$

Many More Tons of Coal

When Uncle Bill came back from the store, Marie said, "Uncle Bill, you mined 142 tons on each of the 2 days."

Uncle Bill thought she had done very well. Then he gave her another problem to do. This is the way Marie figured it out:

$3\overline{)435}$

4 hundreds cannot be divided by 3 evenly. I use 3 of them. 3 hundreds ÷ 3 (how many 3's in 3 hundred?) = 1 hundred. Write 1 in hundreds place in the answer.

I write 3 under the 4 to show I have used 3 of the 4 hundreds. I have 1 hundred left.

$$\begin{array}{rlll}
 & \text{1 hundred} & +\ \text{4 tens} & +\ \text{5 ones}\\
3 \big) & \overline{\text{4 hundreds}} & \overline{+\ \text{3 tens}} & \overline{+\ \text{5 ones}}\\
 & \underline{\text{3 hundreds}} & & \\
 & \text{1 hundred} & +\ \text{3 tens} & \\
 & & \text{or} & \\
 & & \text{13 tens} & \\
 & & \underline{\text{12 tens}} & \\
 & & \text{1 ten} & +\ \text{5 ones}\\
 & & \text{or} & \\
 & & & \text{15 ones}\\
 & & & \underline{\text{15 ones}}
\end{array}$$

I now have 1 hundred and 3 tens to be divided. These make 13 tens. 13 tens ÷ 3 (how many 3's in 13 tens?) = ? I will use 12 of them. 12 tens ÷ 3 = 4 tens. I write 4 tens in the answer. I write 12 tens below the 13 tens to show that I used that many. I have 1 ten left.

The 1 ten I had left and the 5 ones = 15 ones. 15 ones ÷ 3 = ? 15 ones divided by 3 = 5. I write 5 in ones place in the answer and 15 ones under the 15 ones to show that they have been used.

1. Divide, writing the hundreds, tens and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**
$2\overline{)348}$	$5\overline{)655}$	$3\overline{)486}$	$6\overline{)684}$	$4\overline{)576}$	$7\overline{)861}$

Marie Does More Problems Dividing Hundreds

Marie was tired when she finished dividing the problem: $3\overline{)435}$. She thought it was the longest problem she had ever done in her life. But she was happy. She had figured it out all by herself.

Early the next morning, Marie tried another problem just like the one she had done the day before. This time she said, "I am going to think the hundreds, tens, and ones instead of writing the words." (Use your counters to see if you can tell how Marie did the work.)

$$\begin{array}{r} 1 \\ 2\overline{)312} \\ \underline{2} \\ 1 \end{array}$$

Dividing the hundreds:

I have 3 hundreds to be divided by 2. (how many of the hundreds did she use?)

2 hundreds ÷ 2 (how many 2's in 2 hundreds?) = 1 hundred.

How many hundreds are left?

$$\begin{array}{r} 15 \\ 2\overline{)312} \\ \underline{2} \\ 11 \\ \underline{10} \\ ? \end{array}$$

Dividing the tens:

I have 1 hundred and 1 ten to be divided by 2. (how many tens are there in 1 hundred and 1 ten?)

I have eleven tens to be divided by 2. (how many tens did she use?)

10 tens ÷ 2 (how many 2's in 10 tens?) = 5 tens. (how many tens are left?)

$$\begin{array}{r} 156 \\ 2\overline{)312} \\ \underline{2} \\ 11 \\ \underline{10} \\ 12 \\ \underline{12} \end{array}$$

Dividing the ones:

The tens you had left and the ones = ? ones.

12 ones ÷ 2 = ? ones.

What number do you write in ones place in the answer?

Do you have any ones left?

Divide by thinking the hundreds, tens, and ones:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**
1.	$4\overline{)564}$	$3\overline{)411}$	$2\overline{)417}$	$3\overline{)522}$	$6\overline{)732}$	$5\overline{)615}$
2.	$2\overline{)466}$	$4\overline{)862}$	$3\overline{)417}$	$2\overline{)632}$	$6\overline{)852}$	$5\overline{)655}$

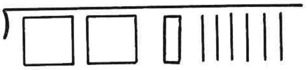
Thinking the Places in Dividing Hundreds

Uncle Bill Gives Marie Another Division Problem

Marie was so happy she didn't know what to do. She said, "I can do any division problem in the whole world!"

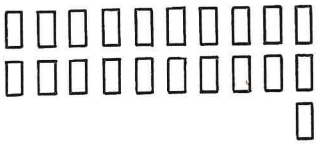
Uncle Bill heard her. He had a teasing smile on his face. "Try this one, Marie," he said. "Eight of us miners mined 216 tons of coal today. If each of us mined an equal amount, how many tons did each mine?"

Marie began to figure:

$8\overline{)216} = 8\overline{)2\text{ hundred} + 1\text{ ten} + 6\text{ ones}}$ or $8\overline{)}$  = ?

Marie saw right away that she could not divide the 2 hundreds by 8.

Then she thought to herself: I wonder if I could do it by changing all the hundreds to tens, and then put them with the other tens.



1 hundred = 10 tens, so
2 hundreds = 20 tens.
I will add my 1 ten to these tens, and I will have 21 tens in all.

$8\overline{)216} = 8\overline{)21\text{ tens} + 6\text{ ones}} = ?$

$$\begin{array}{r} 2\text{ tens} + 7\text{ ones} \\ 8\overline{)21\text{ tens} + 6\text{ ones}} \\ \underline{16\text{ tens}\phantom{ + 6\text{ ones}}} \\ 5\text{ tens} + 6\text{ ones} \\ \text{or}\phantom{\text{ + 6 ones}} \\ 56\text{ ones} \\ \underline{56\text{ ones}} \end{array}$$

21 tens ÷ 8 (how many 8's in 21 tens?) = 2 tens. Write 2 in tens place in the answer. You have 5 tens left (you used 16).

The 5 tens that are left and 6 ones = 56 ones. 56 ones ÷ 8 = ?

Your multiplication facts will help you. ($7 \times 8 = 56$)

Divide using tens and ones: $3\overline{)147} = 3\overline{)14\text{ tens} + 7\text{ ones}} = ?$

	a.	b.	c.	d.	e.	f.
1.	$8\overline{)256}$	$3\overline{)147}$	$2\overline{)134}$	$5\overline{)165}$	$2\overline{)116}$	$3\overline{)114}$

Division—Changing Hundreds to Tens

Marie Spends the Night with Catherine

Catherine is Marie's best friend. They both live on B-Hill. They go to the same school, and their fathers both work in Mine Number 5. Catherine lives in a company house with 4 rooms just like the one Marie lives in.

1. Catherine showed Marie all her picture postcards. She has cards that were sent to her family from everywhere. The girls put all the cards from America in one pile and the cards from foreign countries in another pile. They found that there was the same number in each pile. If there are 348 cards in all, how many cards are in each of the 2 piles?

2. Then the girls took the cards from America and put them in 3 piles. They put all those from the east coast in one group, those from the middle part of the country in another group, and those from the west coast in a third group. If there is an equal number in each group, how many cards are in each of the 3 groups?

3. Catherine has 128 cards from national parks. The girls divided them into 2 equal groups, so that Catherine could take half of them to school the next day to show to her class. How many cards are in each pile?

4. Catherine's mother collects salt and pepper shakers. She has 156 pairs on 3 shelves. How many pairs are on each of the 3 shelves if there is an equal number on each shelf?

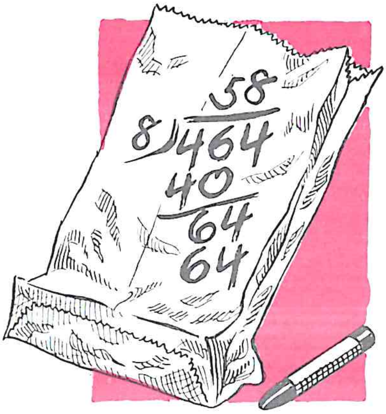
5. Half of the pairs of salt and pepper shakers are in the shape of an animal. How many pairs have animal shapes?

Divide:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**
6.	$3\overline{)648}$	$4\overline{)856}$	$6\overline{)732}$	$5\overline{)635}$	$9\overline{)999}$	$4\overline{)928}$
7.	$8\overline{)920}$	$2\overline{)316}$	$4\overline{)256}$	$8\overline{)912}$	$3\overline{)444}$	$2\overline{)364}$
8.	$5\overline{)675}$	$3\overline{)516}$	$4\overline{)648}$	$2\overline{)516}$	$4\overline{)576}$	$2\overline{)466}$

Thinking the Places in Division

Marie was very excited because she had just figured out how to do a problem in long division by changing the hundreds to tens. She did her figuring on some brown paper bags that her mother had given her. Let's look at her work:



Can you divide 4 hundreds by 8 and get hundreds? There are not enough hundreds, are there? What can you do to the hundreds, so that you can divide?

How many 8's are there in 46 tens? You can begin by taking 8 times any number, and see how close you can come to 46. What are six 8's? This is more than 46, isn't it?

Try 1 less. What are five 8's? This is the value to use. Why?

What number did Marie write in tens place in the answer? Why did she write 40 under the 46?

How many tens are still to be used? How many ones in 6 tens? How many ones in 6 tens and 4 ones?

How many 8's are there in 64 ones?

Why did she write 64 below 64 ones? How many ones are left?

1. Marie likes to go to the company store because Mrs. Williams, the storekeeper, lets her help with the work. Today she let Marie help place 144 glasses of jelly on 3 shelves. How many glasses were put on each shelf if the numbers were equal?

2. Divide:

$3\overline{)156}$ $2\overline{)136}$ $5\overline{)265}$ $3\overline{)234}$ $4\overline{)356}$ $5\overline{)245}$

$3\overline{)138}$ $6\overline{)276}$ $3\overline{)222}$ $2\overline{)116}$ $3\overline{)135}$ $4\overline{)296}$

Averages

Tony heard his father say it takes him an **average** of 9 minutes to load a coal car. He didn't know what that meant.

His father said, "It means that sometimes it takes me *about* that many minutes to fill each of the cars. Sometimes it takes me a minute or two longer to fill one car than it takes to fill another. Sometimes lumps of coal roll off my shovel, so I don't get so much coal on it. Then it takes me a little longer to fill a car.

"I add the times that it takes me to fill all the cars. Then I divide this sum by the number of cars. The answer is called the *average*."

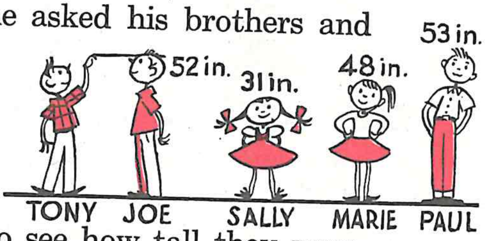
Finding the average is like finding the middle between the largest and the smallest values.

Tony thought hard. Then he asked his brothers and sisters to stand in a line.

Which one is the shortest?

Which one is the tallest?

Which ones are neither the shortest nor the tallest?



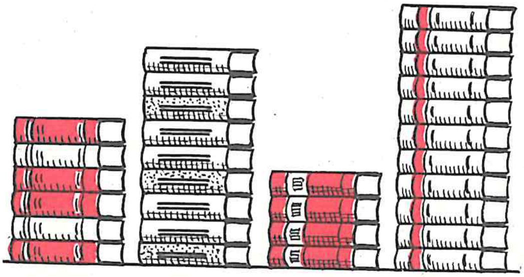
Tony measured all of them to see how tall they were. He added all of the heights and divided this number by 4 because there were 4 children.

Paul	53 inches
Joe	52 inches
Sally	31 inches
Marie	48 inches
	184 inches

$$\begin{array}{r} 46 \text{ in.} \\ 4\overline{)184} \\ \underline{16} \\ 24 \\ \underline{24} \end{array}$$

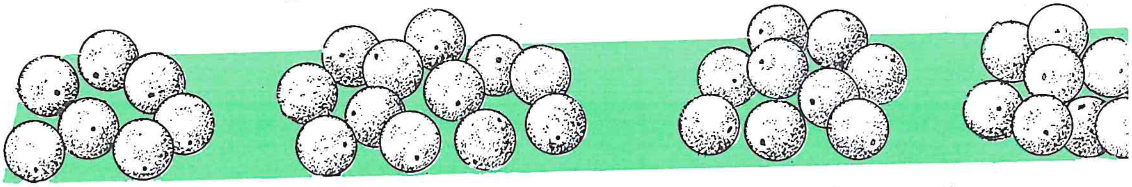
—average height of the four children

Count the books in each of these piles. Add the number in each pile. Divide this number by the number of piles. What is the average?

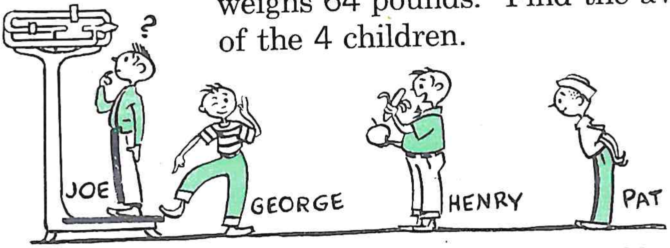


Practice in Finding Averages

1. Count the number of oranges in each group. Find the average of the 4 groups of oranges.



2. These are 4 of Tony's friends. Joe weighs 72 pounds; George weighs 68 pounds; Henry weighs 80 pounds; Pat weighs 64 pounds. Find the average weight of the 4 children.



3. Three of Marie's friends weigh 168 pounds altogether. Find the average weight of each girl.

4. Find the average number of minutes it takes Tony to fill the coal box each night if it takes him a total of 45 minutes for 3 nights.

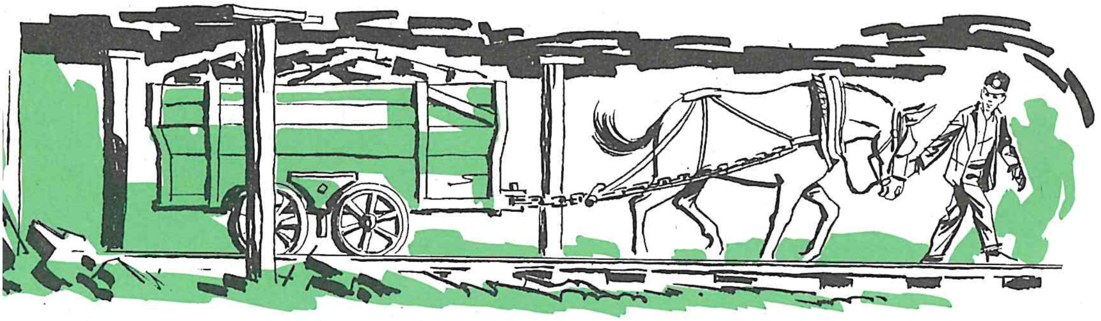
5. If you practice the piano 2 hours in 6 days, how many minutes do you spend each day on the average?

6. Divide:

a.	**b.**	**c.**	**d.**	**e.**	**f.**
$6\overline{)17}$	$9\overline{)47}$	$8\overline{)96}$	$7\overline{)147}$	$8\overline{)176}$	$4\overline{)56}$
$5\overline{)27}$	$4\overline{)84}$	$6\overline{)176}$	$5\overline{)155}$	$2\overline{)268}$	$5\overline{)45}$

7. Do not copy. Give the answers at sight:

$6\overline{)24}$	$5\overline{)45}$	$9\overline{)81}$	$7\overline{)49}$	$8\overline{)56}$	$9\overline{)36}$
$7\overline{)28}$	$6\overline{)36}$	$8\overline{)64}$	$8\overline{)32}$	$7\overline{)42}$	$8\overline{)72}$



Mules Used to Pull the Coal Cars

Mules pulled the coal cars when Tony's father was a boy and worked in the mines. Sometimes the mules were kept down in the mines for months at a time and fed and watered there.

1. One of these mules walked 968 yards in a half day, pulling the coal cars. If he walked this distance while making 2 trips, how far did he walk on one trip?

2. Joe drove one of the mules. He figured that he and his mule walked 124 miles in a month. If they walked about the same distance each week, how far did they walk in a week?

3. Joe said 8 mules ate 96 bushels of oats in 6 months. He fed each mule the same amount every day. How many bushels did each mule eat in the 6 months?

4. Joe raised carrots. One year he had 5 bushels which he did not need for home use. He fed these to the mules. If there are about 84 carrots in each bushel, and he fed each of 7 mules an equal number, how many did each mule get?

5. Joe figures that each of the mules hauls about 134 tons of coal in 2 months. How many tons of coal on the average does each mule haul in one month?

6. Divide:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
$6\overline{)749}$	$4\overline{)148}$	$6\overline{)198}$	$2\overline{)116}$	$5\overline{)215}$	$4\overline{)114}$	$5\overline{)610}$

Machines Replaced the Mules in Hauling Coal

1. A mule used to be able to haul 4 tons of coal in an hour. A motor coal car can haul 96 tons of coal the same distance in an hour. How many times greater is the number of tons hauled by the motor coal car than the number hauled by the mule?

2. It took 24 minutes for a mule to haul a loaded coal car the length of a mile tunnel. It takes 2 minutes for a motor coal car to go the same distance. How many times less is the time taken by the motor coal car?

3. Tony's father told him that the mines were working 3 shifts now. That means that the men were working 3 eight-hour shifts in 24 hours. His father told him that 228 tons of coal is taken out in 24 hours. If an equal number of tons is taken out during each shift, how many tons are mined in each of the 3 shifts?

4. There are 165 men working at Mine Number 5 now. The same number of men work on each shift. Find how many men work on each of the shifts.

Divide:

	a.	b.	c.	d.	e.	f.	g.
5.	$5\overline{)415}$	$3\overline{)513}$	$4\overline{)164}$	$3\overline{)639}$	$7\overline{)175}$	$2\overline{)244}$	$6\overline{)166}$
6.	$6\overline{)814}$	$6\overline{)849}$	$7\overline{)525}$	$6\overline{)396}$	$6\overline{)684}$	$4\overline{)752}$	$7\overline{)854}$
7.	$5\overline{)155}$	$8\overline{)184}$	$6\overline{)762}$	$3\overline{)942}$	$5\overline{)775}$	$8\overline{)752}$	$2\overline{)667}$
8.	$6\overline{)37}$	$7\overline{)49}$	$5\overline{)135}$	$3\overline{)88}$	$9\overline{)191}$	$3\overline{)45}$	$7\overline{)87}$

Eric and Tony Visit the Tipple

The tipple is the place the boys like to visit more than any place in town. All the boys like Mike, the hoisting engineer, who moves the levers that make the big cables move.

1. Mike told them that there were 4 cables running from the shaft. The 4 cables are a total of 344 feet in length. How many feet of cable are there in each one, if they are the same length?

2. An average of 120 coal cars bring coal from the mine to the top of the tipple in an 8-hour shift. About how many coal cars is this an hour if they are evenly spaced?

3. After the coal is weighed and cleaned, it runs along a conveyor and drops into coal cars, according to the size of the piece of coal. One-third of it was lump-size. How many tons of lump-size coal were there in a total of 120 tons of coal?

4. An average coal car on a freight train holds 30 tons of coal. Eric counted 9 coal cars loaded with coal. About how many tons of coal are in 9 railroad coal cars?

5. Tony's father estimated that there were 230 tons in 8 railroad coal cars on a side track by the tipple. Do you think his estimation is right? Check by seeing how many tons each of these cars might hold.

Divide:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**
6.	$7\overline{)154}$	$4\overline{)236}$	$5\overline{)235}$	$8\overline{)768}$	$9\overline{)178}$	$9\overline{)888}$

Problems and Exercises

Today Is the Day of the Contest

This is the day for which all the boys have been waiting! This is the day they have a chance to win the BB gun in the window of the company store. It goes to the boy who comes the closest to guessing the average number of tons of coal in the 9 coal cars on the side tracks.

Tony had gone down every day to admire that beautiful BB gun with the long shining barrel. He thinks that, with it, he can knock a tin can off a rock at 100 yards—maybe even 500 yards.

Every day for a week Tony had gone down to the railroad tracks and estimated his answer. He would ask himself: Was the usual 30 tons about right? Then he would go home and figure it out on paper. He knew just how many coal cars weren't quite so full and how many cars had more coal than the others. At last he sent in his answer: 35 tons

The winner was to be announced at 3 o'clock. All the boys were there when the Superintendent of the mines made the announcement. "There is a total of 292 tons of coal on the 9 coal cars. The average is 32 tons. The boy who came the closest is Eric Radovich," the superintendent said.

$$\begin{array}{r} 32 \text{ R?} \\ 9\overline{)292} \end{array}$$

Tony could hardly believe his ears at first. For a minute he was so disappointed he felt sick, and then he was angry.

"I bet your old answer isn't even right," he told Eric. He decided to check it by adding which took him quite a while.

Then he checked by multiplying 32 tons by 9, which was the number of coal cars. Check the multiplication for Tony: 9 × 32 = ?

Is it shorter to add or multiply in checking division?

$$\begin{array}{rl} 32 & \text{—1 car} \\ +\ 32 & \text{—1 car} \\ \hline 64 & \\ +\ 32 & \text{—1 car} \\ \hline 96 & \\ +\ 32 & \text{—1 car} \\ \hline 128 & \\ +\ 32 & \text{—1 car} \\ \hline 160 & \end{array}$$

Finish adding.

Practice in Checking

1. Estimate the answers to these exercises. Write your estimation on a sheet of paper. Then check your estimates by adding.

a.	**b.**	**c.**	**d.**	**e.**	**f.**
$5\overline{)45}$	$4\overline{)56}$	$9\overline{)117}$	$8\overline{)96}$	$7\overline{)112}$	$6\overline{)78}$

Estimate your answers to these exercises first. Write your estimates on a sheet of paper. Then do the division and check by multiplication:

2. $6\overline{)162}$ $9\overline{)198}$ $7\overline{)224}$ $6\overline{)198}$ $4\overline{)488}$ $6\overline{)264}$

Study the work below:

$$\begin{array}{r} 42\\ 6\overline{)255}\\ \underline{24}\\ 15\\ \underline{12}\\ 3 \end{array}$$

Do you see that there are 42 six's in 255, and there is a remainder of 3?

Check:

$$\begin{array}{r} 42\\ \underline{\times\ 6}\\ 252\\ \underline{3}\\ 255 \end{array}$$

To check this by multiplying, you multiply 6 × 42, and add the remainder. You should have 255. Why?

If you were going to check this exercise by adding, you would add 42 six times and then add the remainder. Why?

3. Divide and check by multiplying or adding. Do not forget to add the remainders:

$8\overline{)54}$ $9\overline{)177}$ $3\overline{)52}$ $6\overline{)111}$ $8\overline{)422}$ $9\overline{)165}$

4. Eric and Tony went to the hills to do target practice with Eric's BB gun. Tony shot 38 times. He knocked a tin can off a rock half this many times. Divide 38 by 2 to find how many times he hit the can.

5. The boys each got 3 rabbits. Tony's mother cut his rabbits into 21 pieces. She then fried them for supper. How many pieces may each of the 7 people in Tony's family have if they each have an equal number?

Zeros in Division

$6\overline{)160} = 6\overline{)1\text{ hundred} + 6\text{ tens} + 0\text{ ones}}$. You cannot divide 1 hundred by 6. You must use 16 tens (1 hundred and 6 tens). Why?

$$6\overline{)160} = \begin{array}{l} \quad\ 2\text{ tens} + 6\text{ ones} \\ 6\overline{)16\text{ tens} + 0\text{ ones}} \\ \quad\ \underline{12} \\ \quad\ \ 4\text{ tens} + 0\text{ ones} \\ \qquad\qquad\quad \text{or} \\ \qquad\qquad 40\text{ ones} \\ \qquad\qquad \underline{36\text{ ones}} \\ \qquad\qquad\ 4 \qquad\quad \text{R} \end{array} = \begin{array}{r} 26 \\ 6\overline{)160} \\ \underline{12} \\ 40 \\ \underline{36} \\ 4\ \text{R} \end{array}$$

16 tens ÷ 6 = ? tens. (How many 6's in 16 tens?) You get 2 tens with some left over. Write 12 under the 16 tens to show that you used 12 of them. Write 2 tens in the answer.

You have 4 tens and 0 ones or 40 ones yet to be divided. 40 ones ÷ 6 = ? ones. Six 6's = 36. Write 36 ones under the 40 ones to show that they have been used. You have a remainder of ? ones.

The answer is 26 R 4.

Check:

$$\begin{array}{r} 26 \\ \underline{\times\ 6} \\ 156 \\ \underline{4\ \text{R}} \\ 160 \end{array}$$

You can either add or multiply to check your answer. You usually multiply because it is shorter.

Divide (estimate your answers first):

	a.	b.	c.	d.	e.	f.
1.	$8\overline{)140}$	$3\overline{)80}$	$7\overline{)220}$	$4\overline{)120}$	$6\overline{)310}$	$5\overline{)210}$
2.	$6\overline{)150}$	$9\overline{)240}$	$3\overline{)70}$	$8\overline{)120}$	$7\overline{)330}$	$3\overline{)450}$

3. Study this exercise (estimate your answer):
$4\overline{)109} = 4\overline{)1\text{ hundred} + 0\text{ tens} + 9\text{ ones}} = ?$
Divide and explain all of the steps.

Making Booklets about Coal

The boys and girls in the fifth grade are making booklets about coal. When they counted the pictures they had drawn, they found that there were 408 altogether. They decided to divide them among the 4 rooms in their school which had been studying coal.

$$\begin{array}{r}
102\\
4\overline{)408}\\
\underline{4}\\
0\\
\underline{0}\\
8\\
\underline{8}
\end{array}$$

4 hundreds divided by 4 = ? (How many 4's are there in 4 hundreds?) The answer is 1 hundred. Why? Write 1 in hundreds place in the answer.

Write the tens you have. There are no tens. How many 4's are there in 0 tens? Write 0 in tens place in the answer. Why?

There are still 8 ones to be divided. 8 ones ÷ 4 = 2 ones. Write 2 in ones place in the answer.

Each room will receive 102 pictures.

1. Divide:

a. $3\overline{)603}$
b. $4\overline{)404}$
c. $5\overline{)505}$
d. $3\overline{)606}$
e. $2\overline{)406}$
f. $8\overline{)808}$

$$\begin{array}{r}
51\\
8\overline{)408}\\
\underline{40}\\
8\\
\underline{8}
\end{array}$$

Can you divide 4 hundreds by 8? What do you do? Why do you write 5 in tens place in the answer? How many 8's are there in 8 ones?

2. Marie is helping Mrs. Williams in the store this afternoon. They are unpacking boxes of groceries and putting them on shelves. They put the same number of cans of beans on each of 2 shelves. If there were 138 cans, find how many they put on each shelf.

3. Mrs. Williams told Marie that the store had been open 198 days so far this year. How many 6-day weeks would there be in this number of days?

Zeros in Division—General Method

Mixed Practice

Divide:

	a.	b.	c.	d.	e.	f.
1.	$5\overline{)500}$	$8\overline{)816}$	$8\overline{)809}$	$4\overline{)340}$	$5\overline{)125}$	$8\overline{)800}$
2.	$7\overline{)721}$	$9\overline{)911}$	$6\overline{)900}$	$6\overline{)606}$	$8\overline{)180}$	$5\overline{)120}$
3.	$8\overline{)150}$	$9\overline{)900}$	$2\overline{)300}$	$7\overline{)70}$	$3\overline{)103}$	$8\overline{)104}$

Add (do not copy these problems; use scratch paper):

	a.	b.	c.	d.	e.	f.	g.	h.
4.	140	109	67	21	45	109	600	143
	154	60	78	45	36	217	243	217
	299	781	66	43	57	368	156	186

5. Subtract:

109	567	90	54	100	305	187	167
94	188	34	17	87	36	128	115

Multiply:

6.	175	81	17	45	113	172	80	94
	× 5	× 3	× 7	× 2	× 3	× 4	× 4	× 6
7.	40	197	42	18	97	62	50	701
	× 8	× 9	× 4	× 7	× 5	× 6	× 9	× 1

8. Write all of the basic addition facts about 7.

9. Count by 10's to 100. How many 10's in 400?

10. Suppose you are subtracting two-place numbers. What do you do when you do not have enough ones in the number from which you wish to subtract?

11. If you know that 9 and 8 are 17, and you want to add 6 to this sum, what are the parts of 6 which you can use to help you get to 20?

12. Give the answers to these: Eight 4's = ? Nine 6's = ? Nine 9's = ? Four 7's = ? Six 8's = ? Seven 9's = ?

Something New to Learn

One day the children came across this exercise in their book. They had to divide 967 by 9. How many 9's do you think there are in 967? How many 9's are there in 100? How many 9's are there in 900? The children estimated that there were eleven 9's in 99 (99 is close to 100), so there were about 110 nine's in 967.

Then they divided:

$$\begin{array}{r} 1 \\ 9\overline{)967} \\ 9 \\ \hline 6 \end{array}$$

9 hundreds divided by 9 = ? (How many 9's are there in 9 hundreds?) Write 1 in hundreds place in the answer. Why?

Now you have 6 tens to be divided. How many 9's are there in 6 tens? There are not enough tens, are there? How will you show there are no groups of tens? You must put a zero (0) in tens place in your answer.

$$\begin{array}{r} 10 \\ 9\overline{)967} \\ 9 \\ \hline 6 \end{array}$$

You still have 6 tens. Use them as ones. 6 tens = 60 ones; 60 ones and 7 ones = 67 ones.

$$\begin{array}{r} 107 \\ 9\overline{)967} \\ 9 \\ \hline 67 \end{array}$$

How many 9's are there in 67 ones? 7 × 9 = 63. This is as close as you can get to 67.

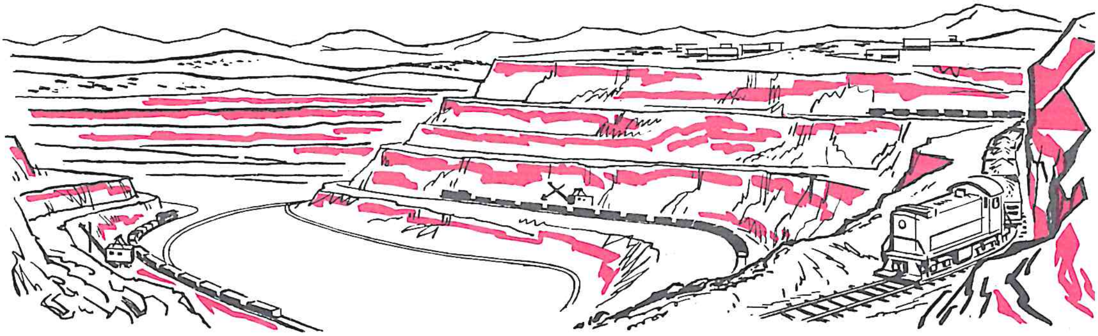
Write 7 in ones place in the answer. You have a remainder of 4 ones. Why?

$$\begin{array}{r} 107 \\ 9\overline{)967} \\ 9 \\ \hline 67 \\ 63 \\ \hline \end{array}$$

Divide (estimate your answer before you divide):

	a.	b.	c.	d.	e.	f.
1.	$4\overline{)412}$	$5\overline{)525}$	$8\overline{)824}$	$3\overline{)327}$	$4\overline{)428}$	$9\overline{)927}$
2.	$4\overline{)836}$	$3\overline{)912}$	$9\overline{)918}$	$6\overline{)612}$	$2\overline{)616}$	$5\overline{)515}$
3.	$8\overline{)816}$	$4\overline{)404}$	$6\overline{)606}$	$2\overline{)818}$	$3\overline{)909}$	$4\overline{)800}$

Divisions Giving 0's in Tens Place in the Answer



Marjorie and Tom Live near a Copper Mine

Marjorie never gets tired of sitting along the side of the copper mine and looking down into it. She likes the bright green, the yellows, and the reds that she sees along the sides of the mine.

Tom likes to watch the train go around the sides of the mine. He likes to watch the dredge work as it lifts ore into the railroad cars.

1. Tom counted and found that it took an average of 10 loads of the dredge to fill a car. How many cars can be filled with 90 loads? (How many 10's are there in 90?)

$$\begin{array}{r l} 80 & \\ -\,20 & \text{—1 hr.} \\ \hline 60 & \\ -\,20 & \text{—1 hr.} \\ \hline 40 & \\ -\,20 & \text{—1 hr.} \\ \hline 20 & \\ -\,20 & \text{—1 hr.} \\ \hline 0 & \end{array}$$

2. There are 80 tons of ore in the cars. A dredge can load 20 tons in an hour. Tom subtracted to find how many hours it took the dredge to load the ore. Count the number of times Tom subtracted to find the number of hours it took to do the work.

3. Tom's father said he would be finished with his work for the day when he had loaded 40 more tons of ore. Subtract to find how many more hours he has to work.

4. Count by 10's to 200. How many 10's in 200?

5. Count by 20's to 200. How many 20's in 100? in 300?

6. Count by 30's to 90; to 270; to 300.

Dividing by 10 and 20; Subtraction and Counting

Dividing by 10, 20, 30, and 40

The boy that lives next door to Tom and Marjorie does not subtract to find how many 20's there are in 80. He does it by division. This is his work:

$$\begin{array}{r} 4 \\ 20\overline{)80} \\ \underline{80} \end{array}$$

You can find how many 20's there are in 80 by counting: 20, 40, 60, 80. There are four 20's in 80 ones. You are using ones, so write the 4 in ones place in the answer.

Four 20's are 80, so write 80 below the 80 ones to show that you used them.

$$\begin{array}{rl} 2 & \\ 30\overline{)70} & \\ \underline{60} & \\ 10 & \text{R} \end{array}$$

Two 30's are 60; three 30's are 90. 90 is too much. You will use 60. This gives you 2 for a one-figure number in the answer. Why?

Write 2 in ones place in the answer, because you are using ones. Write 60 under the 70 to show how many of the 70 ones you used. You have 10 ones remaining.

$$\begin{array}{rl} 2 & \\ 40\overline{)88} & \\ \underline{80} & \\ 8 & \text{R} \end{array}$$

1. Answer these questions about 88 ÷ 40:

a. Can 8 tens be divided by 40? Why not? Can 88 ones be divided by 40?

b. What must you do to find how many 40's there are in 88?

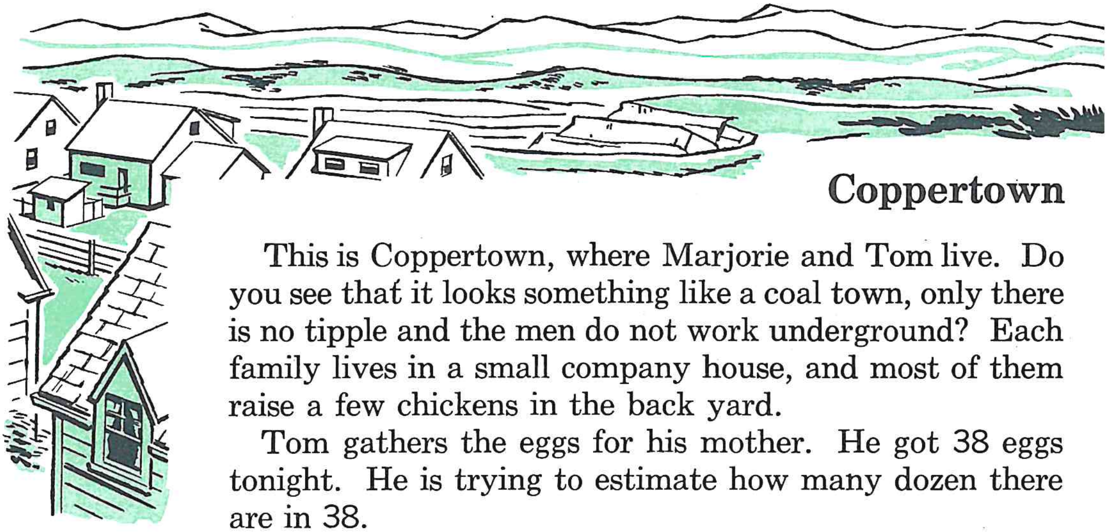
c. Why did you write the 2 in ones place in the answer?

d. How many are two 40's?

e. How many of the 88 ones did you use to make two groups of 40? How many ones are left?

Divide:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**
2.	$40\overline{)80}$	$30\overline{)90}$	$10\overline{)60}$	$20\overline{)50}$	$20\overline{)40}$	$40\overline{)90}$
3.	$30\overline{)80}$	$10\overline{)96}$	$20\overline{)84}$	$10\overline{)76}$	$20\overline{)54}$	$20\overline{)78}$
4.	$30\overline{)86}$	$40\overline{)99}$	$10\overline{)85}$	$20\overline{)75}$	$30\overline{)75}$	$40\overline{)90}$



Coppertown

This is Coppertown, where Marjorie and Tom live. Do you see that it looks something like a coal town, only there is no tipple and the men do not work underground? Each family lives in a small company house, and most of them raise a few chickens in the back yard.

Tom gathers the eggs for his mother. He got 38 eggs tonight. He is trying to estimate how many dozen there are in 38.

$12\overline{)38}$

He knows there are 12 eggs in a dozen, so he is trying to think: How many 12's are there in 38? He says to himself, "Twelve is close to 10, so I will first think how many 10's there are in 38."

$$\begin{array}{r} 3 \\ 12\overline{)38} \\ \underline{36} \\ 2 \end{array}$$

Tom knows there are three 10's in 38 (40 would be four 10's), so he writes 3 in ones place in the answer. (He knows that the answer cannot be a two-place number. Why?) He multiplies 3 × 12 and writes 36 under the 38 ones to show how many he has used. He has 2 ones remaining, so his answer is 3 dozen R 2.

1. Divide:

$22\overline{)48} = ?$

22 is close to 20. How many 20's are there in 48? Write this number in ones place in the answer. Why?

Multiply 2 × 22. Why?

Finish the work.

2. Divide:

a.	**b.**	**c.**	**d.**	**e.**	**f.**
$48\overline{)96}$	$23\overline{)49}$	$21\overline{)44}$	$12\overline{)27}$	$26\overline{)58}$	$20\overline{)60}$

Practice in Dividing

$21\overline{)84}$

You want to find how many 21's there are in 84. Estimate by thinking how many 20's there are in 84 (21 is close to 20). Will the answer be a one- or a two-figure number?

$$\begin{array}{r} 4 \\ 21\overline{)84} \\ \underline{84} \end{array} \qquad \begin{array}{r} 21 \\ \underline{\times\ 4} \\ 84 \end{array}$$

There are four 20's in 80. So, use 4 as an estimation of how many 21's there are in 84. Write 4 in ones place in the answer. Then multiply 4 × 21.

Write 84 under 84 ones to show you used 84 of the 84 ones.

Practice in estimating:

1. $32\overline{)96}$ I will estimate how many 32's there are in 96. I might think how many ? there are in 90. There are ? ? in 90.

2. $34\overline{)68}$ I will estimate how many 34's there are in 68 by thinking how many groups of 30 there are in a group of 60. I will get a one-figure number in the answer. Why?

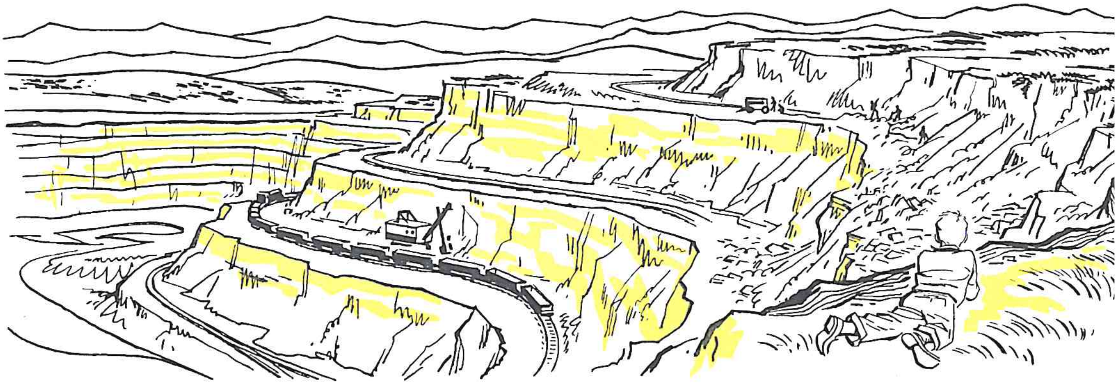
3. $25\overline{)79}$ My estimate should be a one-figure number. Why? I will estimate how many 25's there are in 79 by thinking how many ? there are in 80. There are ? ? in 80.

4. $33\overline{)71}$ I want to know how many 33's there are in 71. 33 is closest to ? . I will think how many there are in 70.

Divide:

	a.	b.	c.	d.	e.	f.	g.
5.	$10\overline{)81}$	$21\overline{)69}$	$20\overline{)90}$	$12\overline{)48}$	$42\overline{)89}$	$51\overline{)68}$	$30\overline{)90}$
6.	$20\overline{)88}$	$26\overline{)58}$	$41\overline{)86}$	$23\overline{)69}$	$30\overline{)77}$	$24\overline{)49}$	$31\overline{)38}$

7. Tomorrow is Marjorie's birthday, and every boy and girl in Coppertown is coming to her party. Marjorie's mother is going to make an angel food cake. It takes 12 eggs to make the cake. Tom gathered 26 eggs last night. How many cakes could be made with them?



Tom Watches the Work in the Mines

Tom likes to lie flat on his stomach and watch the work being done in the open pit. He watches the ore train move along the bench with a load of ore. He sees the big shovels of the dredge move up and down as they load the ore. Today there is going to be a blast on one of the benches.

1. Tom's father is helping to drill the dynamite holes in the top of the bench. It takes him 69 minutes to drill 13 holes for the dynamite. About how many minutes does it take him to drill one hole?

2. Tom's father told him that a two-stick dynamite blast usually breaks up 20 tons of ore. How many blasts of this kind must be set off to have enough ore to fill 2 railroad cars which hold 45 tons each?

3. If it takes 10 tons to fill an ore car, how many of these cars can be loaded from 95 tons of ore?

4. It is 2 miles along the bottom bench in the copper pit. It takes the train 10 minutes to make 1 trip around the bench. How many trips can it make in an hour?

5. Divide:

a.	**b.**	**c.**	**d.**	**e.**
$22\overline{)88}$	$22\overline{)68}$	$11\overline{)24}$	$10\overline{)90}$	$27\overline{)54}$
$31\overline{)97}$	$24\overline{)99}$	$32\overline{)96}$	$45\overline{)95}$	$33\overline{)66}$

Practice with 2-Figure Divisors

Tom Learns a Short Cut

$$\begin{array}{r} 2 \\ 32\overline{)67} \end{array}$$

Tom estimated that there were two 32's in 67. Now he is going to multiply 2 × 32 to see how many two 32's are. He could put it down as a multiplication problem, but his teacher showed him how to multiply without doing this.

$$\begin{array}{r} 2 \\ 32\overline{)67} \\ 4 \end{array}$$

She said, "Multiply 2 × 2 ones. This is 4 ones. Write the 4 ones under the 7 in ones place."

$$\begin{array}{r} 2 \\ 32\overline{)67} \\ \underline{64} \\ 3\text{ R} \end{array}$$

Multiply the tens: 2 × 3 tens = 6 tens. Write 6 under the 6 tens in tens place. Is the answer 2 with a remainder of 3? Why?

Try another one:

$$28\overline{)64}$$

Estimate to find how many 28's there are in 64. You can think how many 30's there are in 60 (28 is close to 30).

Why can't you think: 6 tens ÷ 2 tens = ?. Why does this give a false estimate?

$$\begin{array}{r} 2 \\ 28\overline{)64} \\ 6 \end{array}$$

There are two 28's in 64. Write 2 in ones place in the answer.

Multiply the ones: 2 × 8 ones = 16 ones. Write the 6 ones under the 4 in ones place in 64, and hold the 1 ten.

$$\begin{array}{r} 2 \\ 28\overline{)64} \\ \underline{56} \\ 8\text{ R} \end{array}$$

Multiply the tens: 2 × 2 tens = 4 tens. Add the one ten you held: 4 tens + 1 ten = 5 tens. Write the 5 tens under the 6 tens in 64.

Subtract to see how many ones are left.

1. Divide:

a. $67\overline{)77}$ **b.** $23\overline{)69}$ **d.** $21\overline{)67}$ **d.** $23\overline{)48}$ **e.** $34\overline{)72}$ **f.** $27\overline{)59}$ **g.** $20\overline{)83}$

2. Do these without writing them as multiplication exercises:

$\begin{array}{r} 4 \\ 21\overline{)?} \end{array}$ $\begin{array}{r} 2 \\ 36\overline{)?} \end{array}$ $\begin{array}{r} 2 \\ 45\overline{)?} \end{array}$ $\begin{array}{r} 9 \\ 11\overline{)?} \end{array}$ $\begin{array}{r} 2 \\ 34\overline{)?} \end{array}$ $\begin{array}{r} 2 \\ 48\overline{)?} \end{array}$ $\begin{array}{r} 3 \\ 27\overline{)?} \end{array}$

More Practice in Dividing

$$\begin{array}{r} 2 \\ 43\overline{)96} \end{array}$$

Estimate how many 43's there are in 96. Write this number in ones place in the answer.

$$\begin{array}{r} 2 \\ 43\overline{)96} \\ 6 \end{array}$$

Multiply the ones. Do you get 6?

$$\begin{array}{rl} 2 & \\ 43\overline{)96} & \\ \underline{86} & \\ 10 & \text{R} \end{array}$$

Multiply the tens. Do you get 8?
Subtract to see how many are left.
The answer is 2 with a remainder of 10.

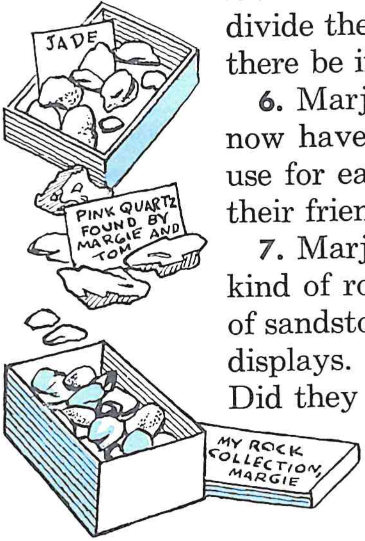
Divide:

	a.	b.	c.	d.	e.	f.
1.	$41\overline{)84}$	$52\overline{)57}$	$60\overline{)90}$	$32\overline{)97}$	$54\overline{)68}$	$42\overline{)90}$
2.	$26\overline{)89}$	$38\overline{)80}$	$25\overline{)75}$	$10\overline{)34}$	$21\overline{)88}$	$40\overline{)80}$
3.	$44\overline{)90}$	$36\overline{)89}$	$52\overline{)60}$	$21\overline{)74}$	$22\overline{)45}$	$27\overline{)53}$
4.	$23\overline{)89}$	$68\overline{)81}$	$29\overline{)96}$	$43\overline{)90}$	$30\overline{)65}$	$38\overline{)88}$

5. Tom and Marjorie went rock hunting with their father and mother. They found 56 pieces of jade. If they divide them equally into 14 groups, how many pieces will there be in each group?

6. Marjorie and Tom found some pink quartz. They now have 66 pieces in all. How many pieces may they use for each of the 11 rock displays they are making for their friends, if they are divided equally?

7. Marjorie and Tom used several pieces of the same kind of rock in their rock displays. They used 45 pieces of sandstone, with an equal number in each of the 11 rock displays. How many pieces did they put in each display? Did they have any pieces left?


JADE
PINK QUARTZ FOUND BY MARGIE AND TOM
MY ROCK COLLECTION, MARGIE

Don Learns How Tall a Bench Is

Don had just moved to Coppertown with his family. The first time he looked down into the copper pit he thought he could have such fun jumping from one bench to the next.

His father told him that it was much further from one bench to another than it seemed. He said it was from 40 to 70 feet. Then he took Don outside to look at the height of their home. He asked, "There's 22 ft.; would you like to jump that distance?"

1. How many houses, the height of the one in which Don lives, could you put on top of each other to reach to the top of one bench 66 feet in height?

2. How many houses this size could you put on top of one another to reach from the bench where Don's father is working to the bench where the ore train is, a distance of 224 feet?

$22\overline{)224} = ?$

Would you estimate the answer to be a two-figure number? Would it be about 10? Why?

Multiply 22 by 10. You see that 10 houses could be put on top of each other on this bench and have 4 feet left over.

$$\begin{array}{r} 1 \\ 22\overline{)224} \\ 22 \\ \hline 4 \end{array}$$

Could you just put a 1 in tens place in the answer and show that you used 22 tens instead of 220? Why?

$$\begin{array}{r} 10 \\ 22\overline{)224} \\ 22 \\ \hline 4 \text{ R} \end{array}$$

Estimate the first figure in the answer in another way. Think: How many 22's are there in 22 tens? You use all 22 tens, because 1 ten × 22 = 22 tens. Explain the rest of the work.

3. Divide:

a. $23\overline{)276}$ **b.** $33\overline{)495}$ **c.** $11\overline{)132}$ **d.** $24\overline{)336}$ **e.** $36\overline{)432}$

Dividing Hundreds by Two-Place Numbers

Practice in Dividing Hundreds

The tallest building in Coppertown is the store. It is 57 feet tall. How many stores this size could you put on top of each other so they would reach from the bottom to the top of the pit, a distance of 627 feet?

$$\begin{array}{r} 1 \\ 57\overline{)627} \\ \underline{57} \\ 5 \end{array}$$

Would you estimate 10 for the answer? Why? 62 tens divided by 57 = 1 ten. Write 1 in tens place in the answer. There are 5 tens left.

$$\begin{array}{r} 11 \\ 57\overline{)627} \\ \underline{57} \\ 57 \\ \underline{57} \end{array}$$

There are 5 tens and 7 ones or 57 ones yet to be divided. 57 ones divided by 57 = 1 one. Write 1 in ones place in the answer.

You could put 11 buildings of this height on top of one another to reach the 627 feet.

Divide:

	a.	b.	c.	d.	e.	f.
1.	$53\overline{)689}$	$59\overline{)844}$	$62\overline{)744}$	$47\overline{)517}$	$52\overline{)728}$	$72\overline{)936}$
2.	$65\overline{)975}$	$74\overline{)814}$	$83\overline{)913}$	$80\overline{)960}$	$58\overline{)870}$	$59\overline{)649}$

Practice these easier divisions. Write only the answer on a piece of paper:

3.	$7\overline{)28}$	$9\overline{)45}$	$8\overline{)64}$	$11\overline{)88}$	$12\overline{)48}$	$6\overline{)42}$
4.	$14\overline{)28}$	$9\overline{)54}$	$15\overline{)45}$	$4\overline{)44}$	$13\overline{)26}$	$15\overline{)45}$

Divide:

5.	$8\overline{)128}$	$9\overline{)197}$	$5\overline{)345}$	$6\overline{)148}$	$8\overline{)264}$	$6\overline{)276}$
6.	$12\overline{)132}$	$7\overline{)154}$	$10\overline{)240}$	$8\overline{)336}$	$11\overline{)121}$	$3\overline{)36}$

7. Fill the blanks:

a. 6 × 7 = ?
b. 9 × 9 = ?
c. 4 × 8 = ?
d. 5 × 9 = ?
e. 6 × 7 = ?
f. 4 × 3 = ?
g. 7 × 7 = ?
h. 4 × 6 = ?
i. 8 × 9 = ?
j. 9 × 7 = ?
k. 8 × 8 = ?
l. 8 × 5 = ?

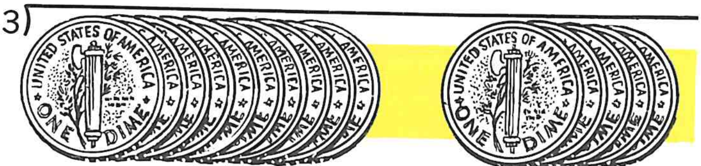
Practice in Division

If you wanted to divide $1.50 among 3 people, how would you know what amount to give each of them?

3)$1.50 = 3)1 dollar + 5 dimes + 0 cents

Do you see that you cannot divide 1 dollar by 3 until you change it to dimes? How many dimes = 1 dollar?

3)$1.50 = 3)



$ .50
3)$1.50
1 5
0
0

15 dimes (15 tens) divided by 3 = 5 dimes. Now, think of them as tens instead of dimes. Write the 5 in tens place in the answer because you are working with tens.

There are 0 cents (or ones) to be divided. Why must you put a 0 in the answer in ones place?

Why is the answer written as $.50?

1. Divide, thinking hundreds, tens, and ones:

a.	**b.**	**c.**	**d.**	**e.**	**f.**
5)$1.75	8)$2.40	2)$1.88	9)$8.19	3)$2.85	5)$3.50

2. Divide by thinking the dollars, dimes, and cents:

5)$2.50   3)$1.86   4)$3.24   6)$1.26   4)$1.24   2)$1.86

3. Divide:

12)292   10)850   20)984   41)886   10)125   30)345

Are You a Good Thinker?

Divide and check by multiplication:

	a.	b.	c.	d.	e.	f.
1.	$6\overline{)80}$	$21\overline{)86}$	$3\overline{)126}$	$5\overline{)575}$	$44\overline{)132}$	$20\overline{)744}$
2.	$6\overline{)246}$	$12\overline{)146}$	$32\overline{)659}$	$5\overline{)\$4.20}$	$9\overline{)\$810}$	$32\overline{)80}$
3.	$23\overline{)506}$	$8\overline{)94}$	$50\overline{)109}$	$10\overline{)550}$	$31\overline{)984}$	$30\overline{)70}$

4. The company store paid $4.90 for 10 quarts of ice cream. How much did the store pay for one quart?

5. Marie is helping Mrs. Williams pack eggs. There are 480 fresh eggs to be packed, a dozen in each box. How many boxes do they need?

6. Mrs. Williams and Marie are putting a crate of oranges in mesh bags, putting 12 in each bag. If there are 248 oranges in the crate, how many bags will they need? Will there be any left over?

7. The milkman delivered 105 quarts of milk to the company store in the 3 milk deliveries of the week. If he delivered an equal number of quarts each time, how many quarts did he deliver on each of the 3 trips?

8. Checking:

a. Check this problem in 2 different ways: $4\overline{)108} = 27$

b. What must you remember to do with a remainder in checking?

9. Estimating:

a. Why is it important to estimate answers?

b. How would you estimate the answer to $11\overline{)132}$?

c. In estimating how many 12's there are in 144, what number close to 12 would help you?

10. Labeling answers:

a. Why is it important to label answers in story problems?

b. What is very important to remember in dividing money problems?

Unit Review

Unit Test

Divide:

	a.	b.	c.	d.	e.	f.
1.	$11\overline{)264}$	$10\overline{)380}$	$25\overline{)245}$	$36\overline{)400}$	$38\overline{)798}$	$20\overline{)360}$
2.	$10\overline{)960}$	$25\overline{)592}$	$27\overline{)391}$	$50\overline{)600}$	$28\overline{)288}$	$16\overline{)160}$
3.	$24\overline{)240}$	$15\overline{)155}$	$32\overline{)328}$	$48\overline{)488}$	$8\overline{)408}$	$3\overline{)165}$

4. The boys and girls are getting a grab bag ready for John, who is ill. They are going to bring things to put in a big bag and John can take out one present in the middle of the morning and one in the middle of the afternoon.

a. The children brought 36 presents. How many days will they last if John takes 2 each day?

b. Three of the children went together to buy a present. It cost $1.05. If they share the cost equally, how much will each child pay?

c. Max brought a big box with 21 pennies wrapped in separate packages. If he wrapped 3 pennies in each package, how many packages must John open?

5. Mary cracked 45 walnuts for her mother. They used $\frac{1}{3}$ of them for a fruit cake for John. How many walnuts were used in John's fruit cake?

6. All the children went along to take the grab bag to John. It took them an hour and a half altogether. They spent half of this time talking to John. How many minutes did they talk to him?

7. Answer these questions:

a. How many dimes can you get from $1.25?

b. How many tens are there in 702? How many tens do you divide by 6 in $6\overline{)702}$?

c. If 702 is to be divided by 18, how many tens will you use when you divide?

UNIT 6

Party Time

Did you ever give a party? The boys and girls in this unit are going to give parties. It all started when Ruth's mother gave a party for her friends. There were so many good things to eat and everyone had so much fun that Ruth decided to give her own party.

Ruth is going to give a slumber party and have waffles for the girls to eat for breakfast. Nancy is going to have gingerbread at her party with lots of whipped cream on it.

Edith lives in the country. She is going to stay overnight with Betty. The girls have so much planned. They want to go shopping for some dresses that are alike. Did you ever try to find something like this and not find what you wanted? Betty's mother finally said she would make dresses exactly alike for the two girls.

Larry buys gumdrops; he likes the red ones best. He never does get around to inviting anyone to a party, so he eats all the gumdrops himself.

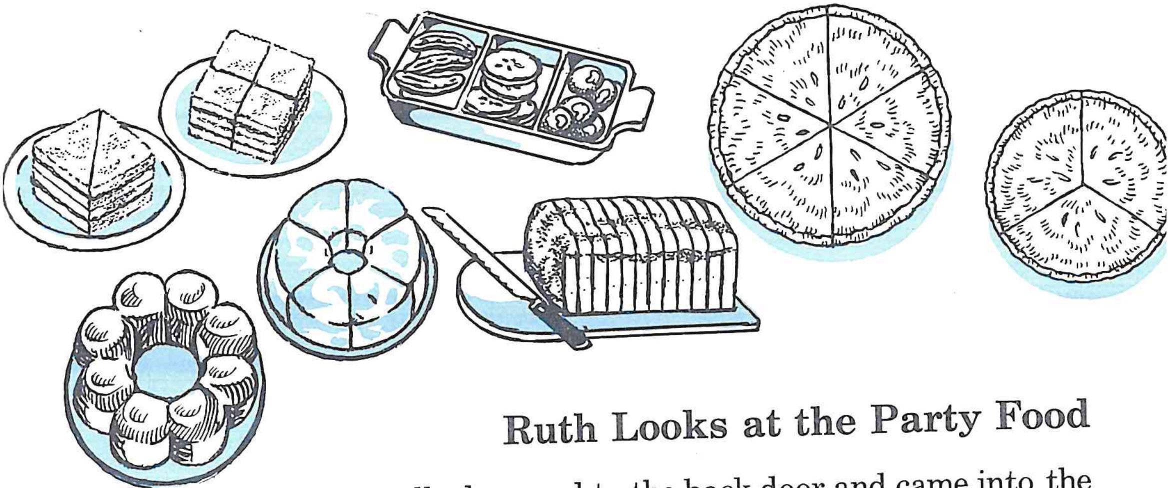
What would you like to have to eat if you were going to give a party?

If 8 of your friends were coming over to your house for ice cream and cake, how would you cut a cake so that you would have 8 pieces of an equal size?

What would you do if 5 of your friends came to your house, and there was only $\frac{2}{3}$ of a pie left? How would you cut the pieces so you and your friends could have an equal amount?

If 4 people are waiting for waffles, could you think of any way you could divide a waffle among these 4 people while you get more waffles made?

If your mother sent you to the store for $\frac{1}{4}$ doz. eggs, how many would you get?



Ruth Looks at the Party Food

Ruth walked around to the back door and came into the house very quietly. She knew that her mother had many guests in the living room. The door to the living room was closed, but Ruth could hear many voices. It seemed to her that everyone was talking at the same time.

Ruth looked at all the food on the table. She was so hungry, but she knew she must not take anything because all of this was for her mother's party. So she just pretended she could have anything she wanted. Which of these would you choose?

1. Would you choose the pie that has been cut into thirds? Which pie has been cut into thirds?

2. Would you choose the pie that has been cut into sixths? Which pie has been cut into sixths?

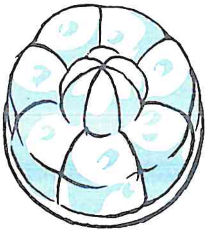
3. Would you choose the nut bread that has been cut into twelfths? Which one has been cut into twelfths?

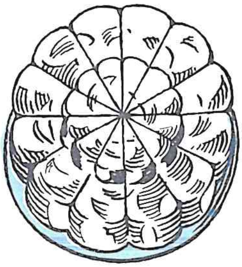
4. Would you choose the salad that has been cut into eighths? Draw a picture of the salad that has been cut into eighths.

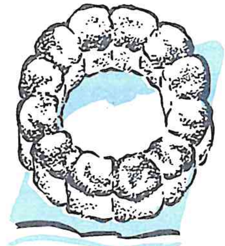
5. Draw a picture of the pickle plate that is divided into 3 equal parts, or thirds.

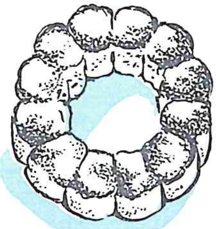
6. Would you take a sandwich from the plate that has halves or would you take a sandwich from the plate that has quarters? Draw the one you would take.

7. How many rolls are there in $\frac{1}{2}$ dozen? in $\frac{1}{4}$ dozen?









Fractional Parts of Wholes

A Slumber Party

Ruth is going to give a slumber party for all the girls in her girl scout patrol. Two girls are going to sleep on this small mattress. They will divide the space on the mattress into 2 equal parts. It is written like this $(\frac{}{2})$ to show that there are 2 equal parts.

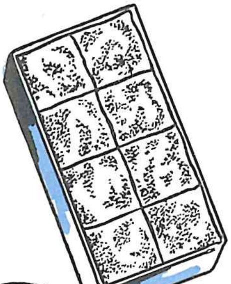
Each girl may have 1 of these equal parts. You write $\frac{1}{2}$ to show how many of the 2 equal parts she may have.

The number below the line tells the number of equal parts into which the whole has been divided. It is called the **denominator**. The number above the line tells how many of the equal parts you are using. It is called the **numerator**.

Four of the smaller girls are going to share this large mattress. Into how many equal parts should it be divided?

What part may each girl have?

If each girl has $\frac{1}{4}$ of the bed, do you see that there are $\frac{4}{4}$ in the whole mattress? $(\frac{4}{4} = 1.$ Why?)



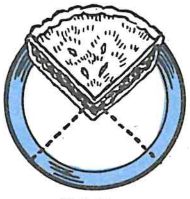
1. At bedtime, Ruth cut a pan of gingerbread into eighths, so each girl could have a piece. How many eighths $(\frac{1}{8})$ are there in the whole?

a. What part may each girl have?

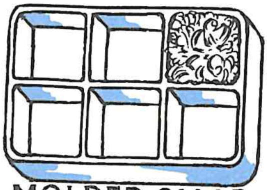
b. If Ruth serves 5 of these pieces first, the fraction would be $\frac{5}{8}$. Why? ($\frac{5}{8}$ means 5 of the $\frac{1}{8}$ pieces.)

2. $\frac{3}{4}$ means ? of the $\frac{1}{4}$ parts.

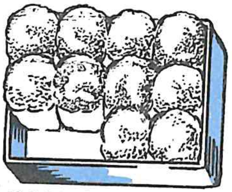
3. Tell what part is left in each of the pictures.



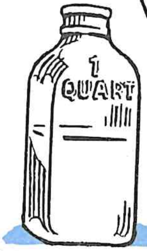
PIE



MOLDED SALAD



PAN OF ROLLS

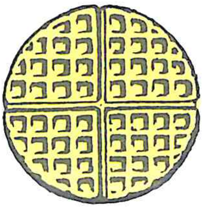


QUART OF MILK

The Meanings of a Fraction

Breakfast Next Morning

The girls were as hungry as bears the next morning. Ruth borrowed another waffle iron, so she could make more waffles.



1. Four of the girls could eat at the same time if they divided a waffle.

a. What part would each girl receive if they divided the waffle equally?

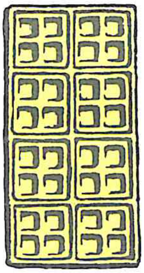
b. What is 1 of these equal parts called?

c. Draw a picture of one of the equal parts.

d. Draw a picture of 2 of the equal parts.

e. Draw a picture of 3 of the equal parts.

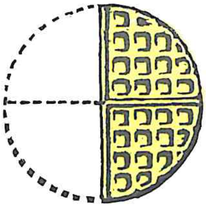
f. How many of these equal parts make up a whole?



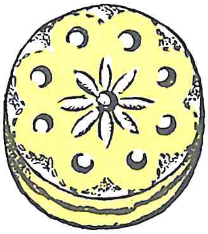
2. The other waffle iron makes a waffle like the one at the left.

a. Into how many equal parts do the markings on the iron divide it?

b. Draw a picture of a waffle like it and label each of the equal parts with a fraction.



3. How much of this waffle is left? See if you can think of 2 ways to write the amount that is left.



4. Draw a cake like this. Cut it into 8 equal parts. Which is more, $\frac{5}{8}$ of a cake or $\frac{7}{8}$ of it? Tell how you know your answer is correct.

5. Three days is $\frac{3}{7}$ of a week. Why?

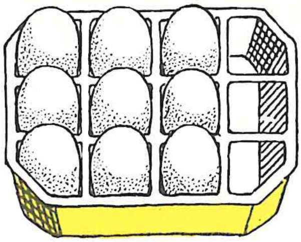
a. What part of a week is a school week?

b. A week is what part of a month?

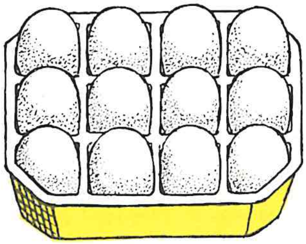
Practice in the Meanings of a Fraction

Eggs, Sunny-Side Up

Some of the girls wanted their eggs fried sunny-side up. Ruth's mother fried $\frac{1}{4}$ of a dozen eggs. Do you see a part of a whole that has parts?



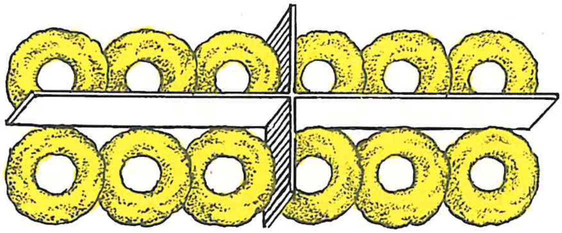
Let's study this next picture:

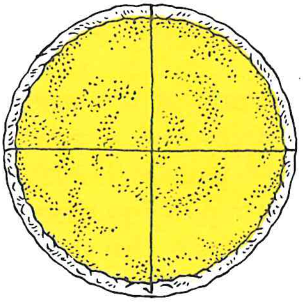


The picture shows a whole. It is a group of 12 eggs, or 1 dozen eggs.

1 dozen things can be divided into 4 equal parts. One of these parts will be $\frac{1}{4}$ of the whole. This has parts of 1 egg each, or $\frac{1}{12}$ of a dozen.

Look at the pictures below to see how they are different.



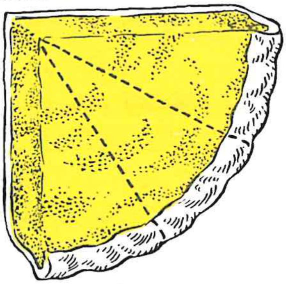


The dozen doughnuts are a whole.

The $\frac{1}{4}$ of the dozen doughnuts is a part of the whole. The part has parts in it (single doughnuts).

Now look at the first drawing of a pie. The pie is a whole. The $\frac{1}{4}$ of the pie is not divided into parts.

Could $\frac{1}{4}$ of a pie have parts if you wanted to divide it? Now tell how the $\frac{1}{4}$ part of the pie is a group, like the doughnuts in $\frac{1}{4}$ of a dozen.



How many things are there in $\frac{3}{4}$ of a dozen?

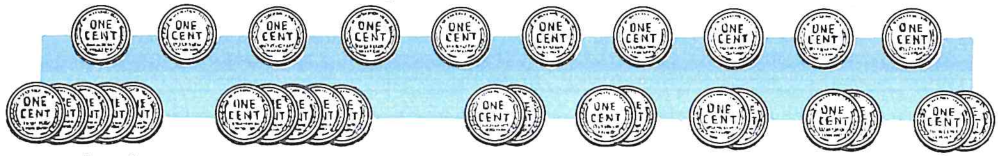
How many parts are there in $\frac{3}{4}$ of a pie, if you cut each $\frac{1}{4}$ into 3 equal parts? Draw a picture to show this.

One pound = 16 ounces; $\frac{1}{2}$ pound = ? ounces.

Draw a clock face. Into how many equal parts of 5 minutes each can $\frac{1}{4}$ of an hour be divided?

Nancy Decides to Give a Party

Nancy had such fun at Ruth's slumber party that she decided to give a party. She counted her money to see how much she had saved. She made these groups of equal parts from a group of 10 pennies:



1. $\frac{1}{2}$ of a group of 10 pennies is a group of ? pennies.

2. $\frac{1}{5}$ of a group of 10 pennies is a group of ? pennies.

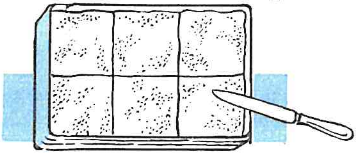
3. One penny is what part of a group of 10 pennies? Why? One penny is what part of a group of 5 pennies? Why?

4. A group of ten pennies may have the unequal parts of 6 pennies and 4 pennies. Tell how you know that a group of 4 pennies is either $\frac{4}{10}$ or $\frac{2}{5}$ of a group of 10 pennies.

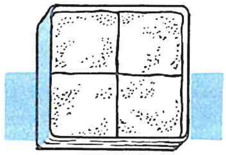
5. A group of 6 pennies is what fractional part of a group of 10 pennies? Use the pictures and give two answers.

6. A quarter is worth 25¢. It equals $\frac{1}{4}$ of a ? . What coin is $\frac{1}{5}$ of a quarter? Name a group of other coins that equals $\frac{1}{5}$ of a quarter.

7. Nancy wanted to know how many pans of gingerbread she should make for her party. She looked at the cake pans to see how many pieces each could hold.



a. ? equal pieces
Each piece is ? of the whole.



b. ? equal pieces
Each piece is ? of the whole.

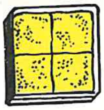
Nancy decided that the pieces were too large, so she planned to cut each piece into halves. Then how many equal pieces will there be in each pan?

Nancy Tries the Gingerbread Recipe

Nancy decided she had better try the gingerbread recipe before the party. She made a pan of gingerbread for dinner.

Her sister begged for a big piece. Nancy said, "Which would you rather have, $\frac{1}{4}$ or $\frac{1}{8}$ of the gingerbread?"

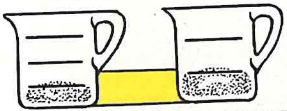
Her little sister said, "Please, may I have $\frac{1}{4}$? It's more."



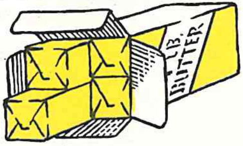
1. Was Nancy's little sister right about which was larger, $\frac{1}{4}$ or $\frac{1}{8}$?

2. Why is $\frac{1}{8}$ just half as large as $\frac{1}{4}$?

3. These are the things Nancy used in her gingerbread.



a. Which is more, $\frac{1}{4}$ cup of sugar or $\frac{1}{3}$ cup of sugar? Why?

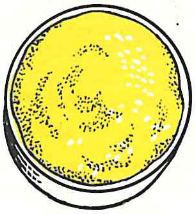


b. Nancy used $\frac{1}{4}$ pound of butter. How many sticks did she use? (One box of 4 sticks equals 1 lb.)

c. If she had used $\frac{1}{2}$ stick, how much of a pound of butter would she have used?

d. Draw a picture of a stick of butter. Divide it into fourths ($\frac{1}{4}$'s). How many $\frac{1}{4}$'s are there in a stick of butter?

4. Nancy had some gingerbread dough left, so she baked it in this pan. Draw a picture of it on paper.

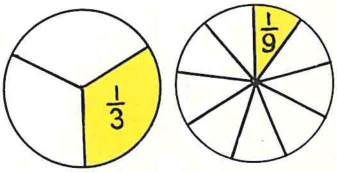


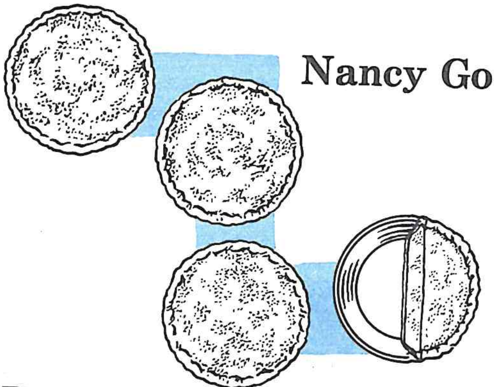
a. Divide it into 3 equal parts. What is each part called?

b. Cut each of these thirds into 2 equal parts. How many pieces in the whole? What is each part called?

c. Draw another picture of this pan of gingerbread. Divide it into 3 equal parts. Now, divide each of these parts into 3 equal parts. How many equal parts in the whole? How many $\frac{1}{9}$'s in $\frac{1}{3}$?

d. The larger the denominator in a fraction that tells one of the equal parts of a whole, the smaller the part is. Why? Make another drawing to show this, using fourths and eighths.





Nancy Goes Shopping with Her Friend

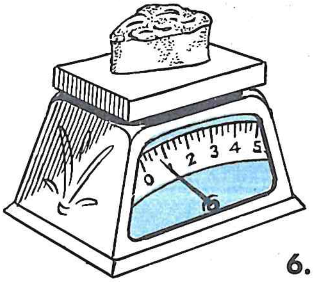
The day before her party, Nancy went shopping with a friend.

1. Nancy's friend bought $\frac{1}{2}$ pie. How many half-pies are there in the pies shown in the picture at the left?

2. How would you find how many half-pies there are in 3 whole ones without counting?

3. Jane bought $\frac{1}{4}$ dozen brownies. How many brownies did she buy?

4. The brownies are 60¢ a dozen. How much must Jane pay for $\frac{1}{4}$ dozen?



5. Jane bought $\frac{3}{4}$ pound of poundcake. Look at the scales to see how many $\frac{1}{4}$ pounds this is. How many ounces are there in $\frac{3}{4}$ of a pound?

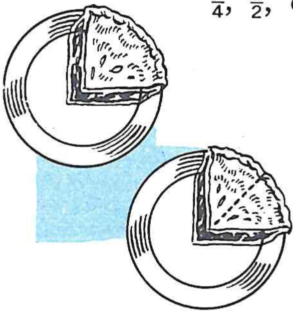
6. Jane's mother asked her to buy $\frac{2}{3}$ of a yard of ribbon. How much less than a yard will Jane get? How many inches in $\frac{2}{3}$ of a yard?

7. Use a picture to tell which is larger, $\frac{1}{3}$ or $\frac{1}{6}$.

8. Which is smaller, $\frac{1}{5}$ or $\frac{1}{10}$? Why?

9. If you use the same size whole, which is largest:

a.	**b.**	**c.**
$\frac{1}{4}$, $\frac{1}{2}$, or $\frac{1}{8}$?	$\frac{1}{3}$, $\frac{1}{6}$, or $\frac{1}{2}$?	$\frac{1}{2}$, $\frac{1}{8}$, or $\frac{1}{16}$?

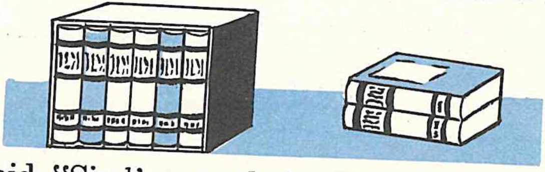


10. When the two girls got home, Jane's mother said they could divide the pie that was left. How much of the whole pie was left?

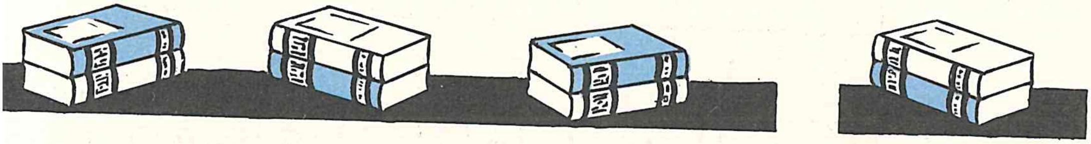
They divided the pie equally. What part of a whole pie did each girl receive?

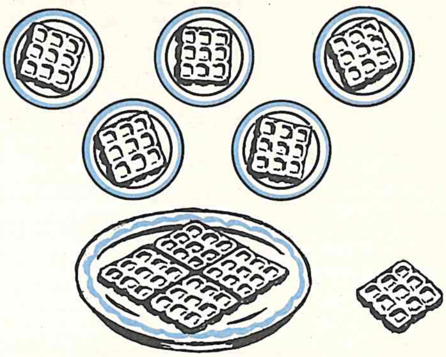
Nancy's Party

Nancy is checking to be sure that none of the cards are missing for the games they are going to play at the party. There are 6 games in each box. She checked 8 games.



Nancy said, "Six $\frac{1}{6}$'s = a whole. Eight $\frac{1}{6}$'s = 1 whole and part of another whole." Can you tell how much more than a whole $\frac{8}{6}$ is?



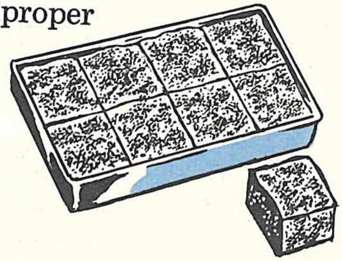


Everyone was so busy getting ready for the party that they had decided to have a quick dinner of waffles. The picture shows how many parts of a waffle were left.

Nancy put them on a plate. Do you see that she had more than a whole waffle when she put the fourths together? $\frac{5}{4}$ = 1 whole and $\frac{1}{4}$ left over.

Do you see in $\frac{5}{4}$ that there is a 5 placed over a 4? Does this seem improper to you for a fraction? Why?

Fractions like $\frac{5}{4}$, $\frac{4}{4}$, and $\frac{3}{2}$ are called **improper fractions.** Any fraction that tells you that you have enough, or more than enough, equal parts to make a whole is an improper fraction.

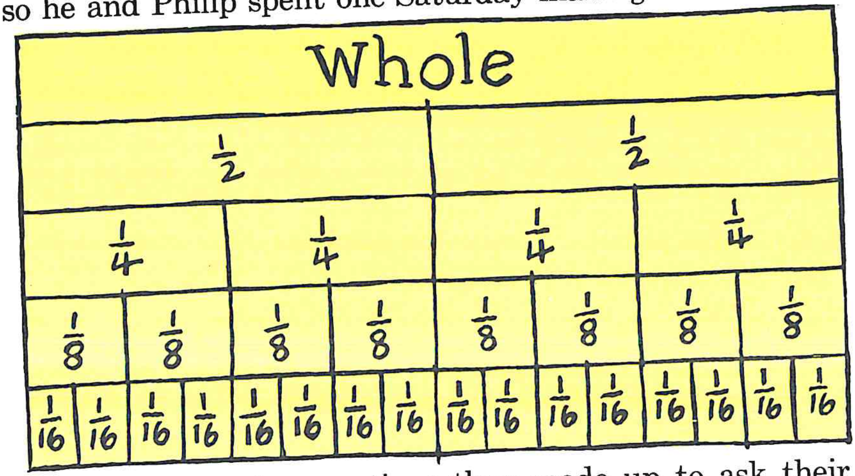


After the party Nancy tried to put the pieces of gingerbread that were not eaten back in the pan. This is what she had:

$\frac{9}{8}$ = ? whole and $\frac{?}{8}$ left over.

John and Philip Make a Fraction Board

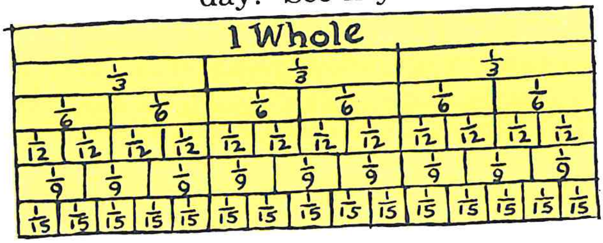
John and Philip found a piece of plywood in the garage. John asked his father if he could have it to make a fraction board for his teacher. His father said he could have it, so he and Philip spent one Saturday making it.



1. These are the questions they made up to ask their classmates the next day. See if you can answer them.

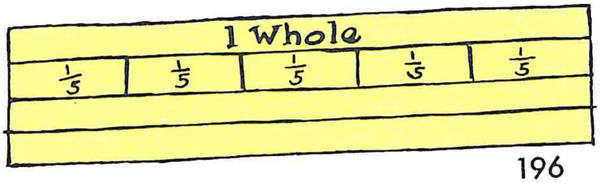
a. How many $\frac{1}{4}$'s are there in $\frac{1}{2}$?
b. How many $\frac{1}{8}$'s are there in $\frac{3}{4}$?
c. Are there more $\frac{1}{16}$'s in $\frac{1}{4}$ than in $\frac{2}{8}$?
d. One-half = ? eighths. ? fourths. ? sixteenths.
e. Which is more, $\frac{6}{8}$ or $\frac{11}{16}$?

2. A boy in the class brought this board to class the next day. See if you can answer his questions.



a. How many $\frac{1}{9}$'s in $\frac{1}{3}$?
b. How many $\frac{1}{12}$'s in $\frac{2}{3}$?
c. Which is more, $\frac{1}{3}$ or $\frac{6}{12}$?
d. How many sixths ($\frac{1}{6}$) are there in $\frac{1}{3}$?

3. Make a chart starting with fifths. Then make up some questions for your classmates to answer.



Practice with Fractions

1. Take your foot ruler out of your desk. What part of a foot is 1 inch?

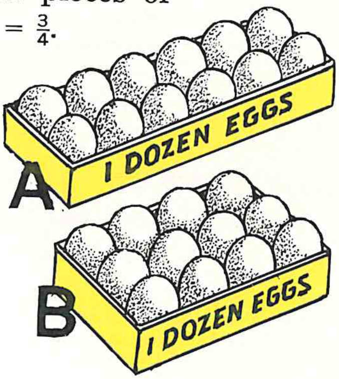
2. Why is $\frac{6}{12}$ of a foot the same measurement as $\frac{1}{2}$ of a foot?

3. Is 8 inches equal to $\frac{2}{3}$ of a foot ($\frac{8}{12} = \frac{2}{3}$)? Why or why not?

4. Find a piece of scratch paper that is 12 inches long. Fold it into fourths. How many $\frac{1}{4}$'s do you have? Put an x where the $\frac{3}{4}$ mark is.

Find another piece of scratch paper that is 12 inches long, and fold it into twelfths ($\frac{1}{12}$). Put the pieces of paper side by side to find how many twelfths = $\frac{3}{4}$.

5. Look at pictures A and B.



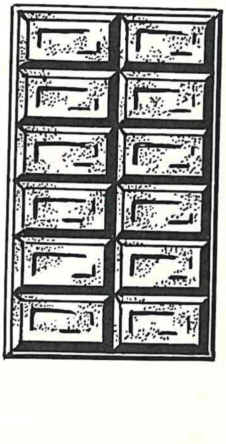
a. What fractional part of a dozen eggs is 6 eggs?

b. In which of the pictures is it easier to find $\frac{1}{6}$ of a dozen?

c. In which of the pictures is it easy to see that $\frac{2}{12} = \frac{1}{6}$?

d. How many eggs are there in $\frac{1}{4}$ of a dozen?

e. Draw pictures of the 2 boxes of eggs. Then draw heavy lines to show that the dozen eggs in each box may be divided into $\frac{1}{3}$ parts.



6. Draw picture B. Then with red lines show how you would divide it into thirds. How many twelfths are there in $\frac{2}{3}$?

7. There are 16 ounces in a pound. How many ounces in $\frac{1}{2}$ pound? in $\frac{1}{4}$ pound?

8. Look at this bar of baking chocolate. $\frac{1}{2}$ pound = $\frac{?}{12}$ pound or $\frac{?}{6}$ pound.

9. How much longer is $\frac{1}{3}$ of a yard than $\frac{1}{4}$ of a yard?

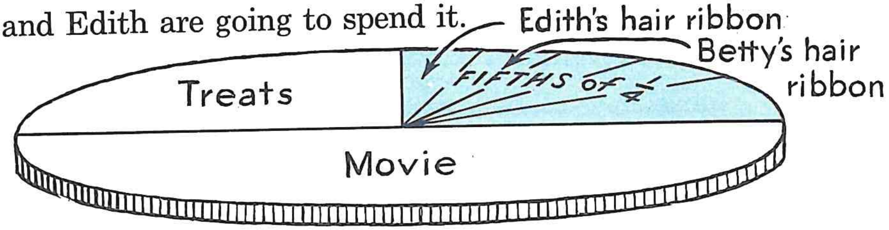
10. How many inches in $\frac{2}{3}$ of a yard? in $\frac{1}{2}$ a yard?

Edith Spends the Week End with Betty

Edith and Betty are very good friends. Edith lives on a farm near the town where Betty lives, and they go to the same school.

Betty is so excited she can hardly wait for school to be out. Then the girls can go home together, and Edith will spend the weekend with her.

This is the dollar Betty has saved, and this is the way she and Edith are going to spend it.



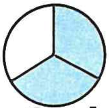
1. What part of the dollar are they spending for a movie?

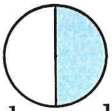
2. What fraction tells you the part they are going to spend for treats? What coin has as much value as this fractional part of a dollar?

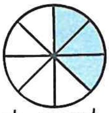
3. What fraction tells you the amount they are spending for the other things they are going to buy? They have divided $\frac{1}{4}$ into 5 equal parts. How much money will they spend for each of these things?

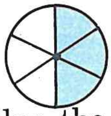
The girls went to the store for Betty's mother. Edith was surprised to know that eggs cost 60¢ a dozen there. Her father sells his eggs for 40¢ a dozen.

When the girls got home, Edith told Betty's mother how much her father got for a dozen eggs, a quart of milk, a chicken, and a bushel of potatoes. Betty's mother made these graphs to show what part a farmer receives of each dollar people spend for food.





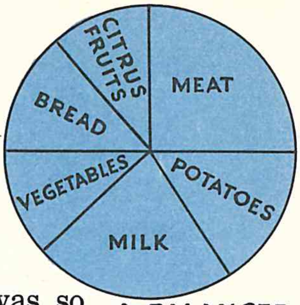




Read the graphs and tell what part of a dollar the farmer receives.

Reading Circle Graphs for Practice

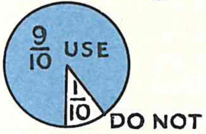
The girls had just finished reading the comics in the paper when they saw this graph on another page of the paper. Write down everything you learn from it.



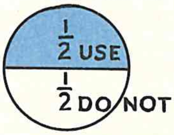
A BALANCED DIET

Betty and Edith thought reading the graphs was so much fun that they looked for more of them in books. They found some that gave information about the number of United States families that use electric appliances.

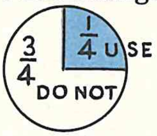
Electric Refrigerators



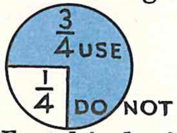
Television



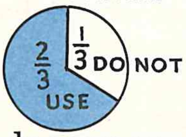
Electric Ranges



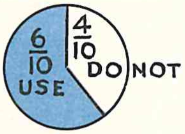
Electric Washing Machines



Electric Toasters



Vacuum Cleaners



1. What kind of electric appliance do more people have than any other? What kind is found least often in the home?

2. The fractions for the electric refrigerators show that the whole has been divided into ? equal parts. Does the denominator tell the answer to this question? Could you find it by adding the two numerators that are given? Why would this sum answer the question?

3. Look at the graph that tells the number of families that have electric washing machines. What does the numerator tell you?

4. Is it correct to say that there are about twice as many families who have electric toasters as those who do not have them?

5. Find the missing number in these. Then draw circles and divide them into parts to show the fractions.

$\frac{2}{3} = \frac{?}{6}$ $\frac{3}{4} = \frac{?}{8}$ $\frac{4}{8} = \frac{?}{4}$ $\frac{4}{16} = \frac{?}{4}$

Fractions in Money

After the lights were out and the girls were in bed, they talked about their shopping trip the next day. They wanted to have everything planned, so they would have time to go to the Saturday afternoon movie.

1. Betty is going to buy the tickets. Tickets cost 25¢ each.

a. What part of a dollar will be used to buy both tickets? Check by thinking that it takes two half-dollars to make a dollar.

b. What part of a dollar is 25¢? (The other name for 25¢ tells you the answer.)

2. Edith is going to treat each of them to a cherry sundae after the movie. A cherry sundae costs 20¢.

a. What part of a dollar is 20¢? (Begin by thinking how many dimes there are in one dollar.)

b. What part of a dollar will Edith spend for both cherry sundaes?

3. Draw pictures to prove your answers to these questions:

a. A penny is what fractional part of a dime?

b. A nickel is what fractional part of a dime?

c. A dime is what fractional part of a quarter?

d. Twenty cents is what fractional part of a half-dollar?

e. How do you know that a half-dollar can equal $\frac{1}{2}$ of a dollar?

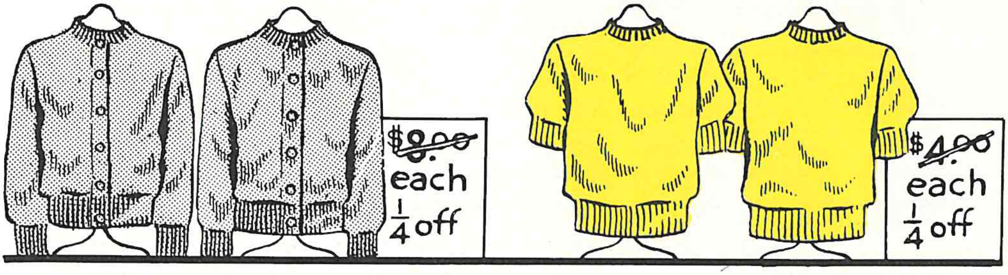
See how many of the following you can do without looking at the charts on Page 196. Then use the charts to check your work.

	a.	**b.**	**c.**	**d.**
4.	$\frac{4}{8} = \frac{?}{12}$	$\frac{3}{4} = \frac{?}{8}$	$\frac{3}{9} = \frac{?}{3}$	$\frac{2}{6} = \frac{?}{3}$
5.	$\frac{10}{12} = \frac{?}{6}$	$\frac{2}{3} = \frac{?}{9}$	$\frac{4}{6} = \frac{?}{3}$	$\frac{6}{8} = \frac{?}{4}$
6.	$\frac{3}{12} = \frac{?}{4}$	$\frac{5}{10} = \frac{?}{4}$	$\frac{4}{4} = ?$	$\frac{8}{6} = ?$

Edith and Betty Go Shopping

The girls are going to buy sweaters that are alike. Sweaters are on sale now, so they know this is a good time to buy.

They saw these sweaters in the window.



What would these sweaters cost the girls?

Do you understand what the prices mean?

Two of the sweaters were $4.00 each, but now they are $\frac{1}{4}$ off. Can you tell by this picture what $\frac{1}{4}$ off means?

You could also find how much $\frac{1}{4}$ off $4.00 is by dividing that amount by 4: $4\overline{)\$4.00}$. Do you see that you would have $1.00 off, and that the sweaters would cost the girls $3.00 each?

The other sweaters were $8.00 each. They are on sale at $\frac{1}{4}$ off. Tell by this picture what $\frac{1}{4}$ off would be:

You could also find it by dividing $8.00 by 4: The sweaters are selling for $2.00 less than they did before, so you must subtract $2.00 from $8.00. By doing this you find that these sweaters are now priced at $6.00 each.

$$\begin{array}{r} \$2.00 \\ 4\overline{)\$8.00} \end{array}$$

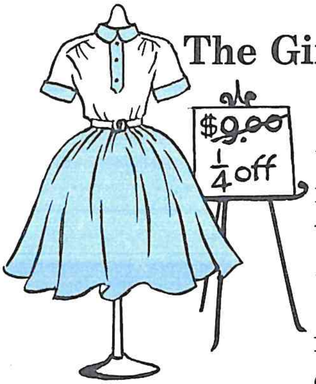
1. Find how much these things cost now:

a. a dress that once cost $6.00, now marked $\frac{1}{3}$ off.

b. a coat that once cost $12.00, now marked $\frac{1}{2}$ off.

c. a jacket that once sold for $12.00, now $\frac{1}{4}$ off.

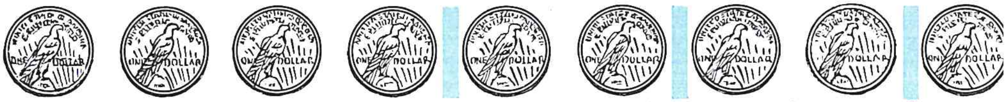
d. a dress that was $6.00, now marked $\frac{1}{2}$ off.



The Girls Shop for Dresses That Are Alike

Betty and Edith are shopping for dresses that are alike. They both like this dress very much. How much would they have to pay for this dress on sale? See if you can find this answer.

Here are 9 silver dollars. If you divide them into 4 equal parts $4\overline{)9}$, you have one of the dollars left over.



How many dollars are in each of the 4 equal groups?

What are you going to do with the dollar that is left? Can it be divided into 4 equal parts? What will each of the equal parts be?

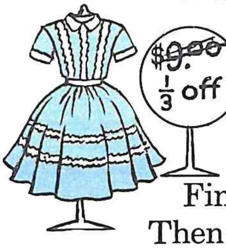
What will $\frac{1}{4}$ of \$9.00 be? Check it by $4\overline{)\$9.00}$.

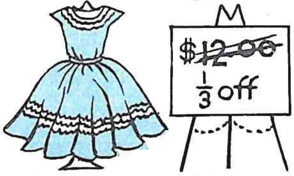
What is the amount that can be subtracted from the \$9.00?

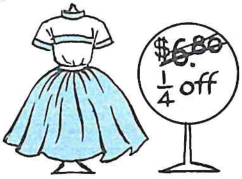
What will the dress cost on sale?

Betty and Edith found other dresses they liked, but they could not find two dresses alike among those they thought were pretty.

Here are some of the bargains they saw:







Find how much they would save in buying each of these. Then find the sale cost of each dress.

Find how much you save in each of the following: $\frac{1}{3}$ off on \$6.00; $\frac{1}{4}$ off on \$8.00; $\frac{1}{4}$ off on \$12.00.

In which of these is the greater amount saved, $\frac{1}{4}$ off on \$9.60 or $\frac{1}{3}$ off on \$9.60? Write out your work to prove this.

Betty's Mother Makes Their Dresses

Betty's mother said she would make dresses exactly alike for the girls. Each girl bought everything that was needed to make her dress.

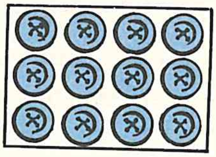
When Betty went to buy buttons for her dress, she found that the price was 84¢ a dozen. What would 9 buttons cost?

This is the way she solved her problem:

1. What was the price of one button? Why?

2. What will the 9 buttons cost?

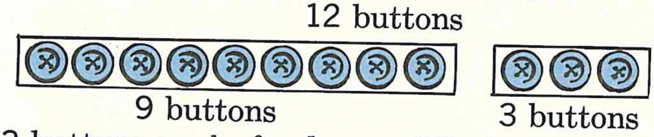
3. What fractional part of a dozen buttons is 1 button?



$$\begin{array}{r} 7 \\ 12\overline{)84\text{¢}} \end{array} \qquad \begin{array}{r} 7\text{¢} \\ \times\, 9 \\ \hline ? \end{array}$$

4. Tell why 9 buttons will be $\frac{9}{12}$ of a dozen.

5. Could Mary have figured this way?



3 buttons are $\frac{1}{4}$ of a dozen. Why?

9 buttons are $\frac{3}{4}$ of a dozen. Why?

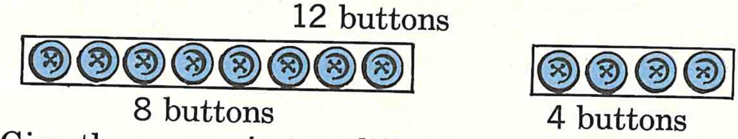
$$4\overline{)84}$$

The cost of $\frac{1}{4}$ of a dozen would be one of the 4 equal parts of 84¢. Why?

$\frac{3}{4}$ of a dozen would cost 3 times as much as $\frac{1}{4}$ of a dozen. Why?

The cost would be 3 × 21¢. Why?

6. What part of a dozen is 8 buttons?



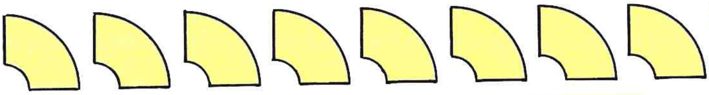
Give the answer in two different ways by:

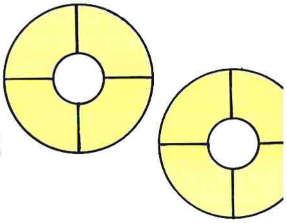
a. thinking of one button as a fractional part of 12 buttons.

b. thinking of a group of 4 buttons as a fractional part of 12 buttons.

Everyone Is Sewing Today

The girls watch while Betty's mother cuts out the pieces of cloth. She needs two large circular pieces for both skirts (like the pictures shown here).



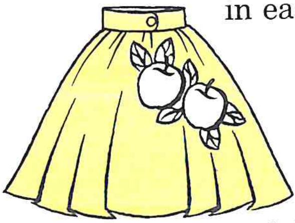


8 of the $\frac{1}{4}$ pieces = 2 wholes. Why?

1. Draw a circular skirt, and divide it into 4 equal parts. You can see that you could not get cloth wide enough to cut a circular piece large enough for your skirt. You would have to use pieces and sew them together.

2. If you are going to use 6 pieces for each skirt, you will need 12 of the $\frac{1}{6}$ pieces for both skirts. Draw 12 of the $\frac{1}{6}$ pieces.

Now make a drawing of the 2 skirts showing 6 pieces in each skirt.



3. The girls are going to sew red apples on each skirt. They want 2 apples on the front and 2 apples on the back.

How many apples will they need for both skirts?

4. Betty is using $\frac{1}{4}$ of the 8 apples for the front of her skirt. How many apples is $\frac{1}{4}$ of 8 apples?

$\frac{1}{4}$ of the 8 apples = 2 apples. Why?

5. Edith is using $\frac{1}{2}$ of the 8 apples for the front and back of her skirt. How many are $\frac{1}{2}$ of 8 apples? Draw a picture to prove your answer.

6. Betty's mother cut 16 apple leaves. Edith may have $\frac{1}{4}$ of them for the front of her skirt. How many are $\frac{1}{4}$ of 16 apple leaves?

Betty may have $\frac{1}{2}$ of the 16 apple leaves for the front and back of her skirt. How many are $\frac{1}{2}$ of 16 apple leaves?

Practice in Fractional Parts of Groups

Danny Helps Sew

Danny is Betty's little brother. He wants to help with the sewing.

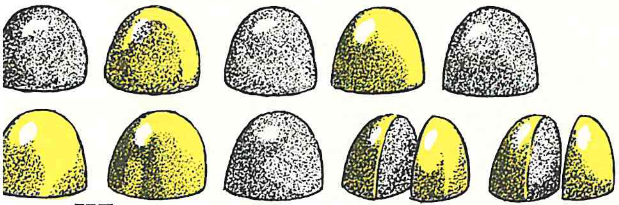
These are the pieces for the collars. Danny is fitting them together.

1. There are 6 pieces for both collars. Danny ran away with $\frac{1}{3}$ of them. How many pieces are missing? ($3\overline{)6}$)

Betty had to give Danny a ride in his red wagon before he would tell her where he had hidden the pieces of cloth.

2. Betty put 10 pieces of candy on a plate. She wanted everyone to have an equal amount. She must divide the 10 pieces into 4 equal parts:

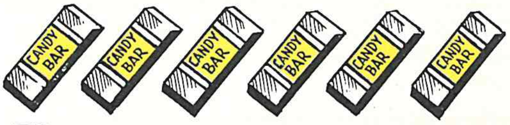
$$\begin{array}{rl} 2 & \text{pieces in each group} \\ 4\overline{)10} & \\ \underline{-8} & \\ 2 & \text{pieces left over.} \end{array}$$



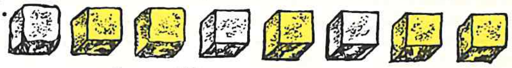
What did Betty do to the 2 pieces left over to divide them equally into 4 parts?

3. How much is $\frac{1}{4}$ of 10?

4. Find $\frac{1}{4}$ of these 6 candy bars.

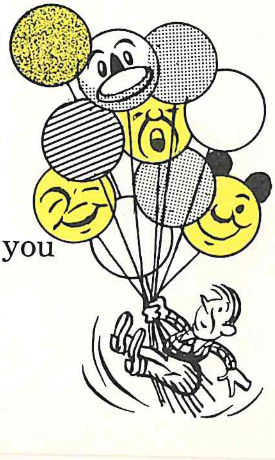


5. Find $\frac{1}{3}$ of these 8 pieces of candy.

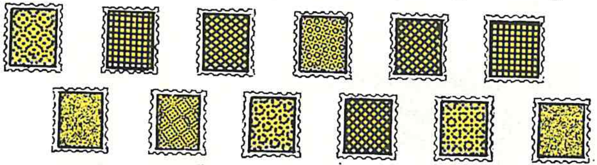


6. Find $\frac{1}{5}$ of these 10 balloons.

7. Find $\frac{3}{5}$ of the balloons. Which is more, $\frac{1}{5}$ or $\frac{3}{5}$?



8. How many stamps in $\frac{1}{4}$ of this group? in $\frac{1}{3}$ of it?



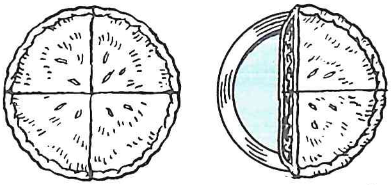
How many more or less stamps would you have if you had $\frac{1}{4}$ of them instead of $\frac{1}{3}$ of them?

Problems

The Girls Get Dinner

Edith and Betty are going to cook dinner so Betty's mother can sew on their dresses. There were 6 people to feed. Betty looked to see if there was enough pie left for dinner. She found that there was one whole pie and half of another one. She knew for 6 people she could cut the whole one into 4 pieces and the half into 2 pieces of the same size.

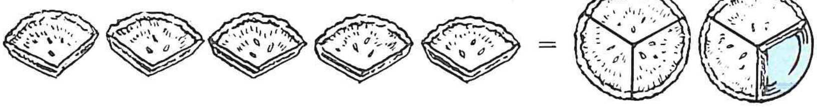
Betty's brother, Pete, came in and wanted a piece of pie because he said he could not wait until dinner. When Betty's mother told him that if he ate some, there would not be enough for dinner, he said, "There would still be a whole pie left, and it could be cut into smaller pieces."

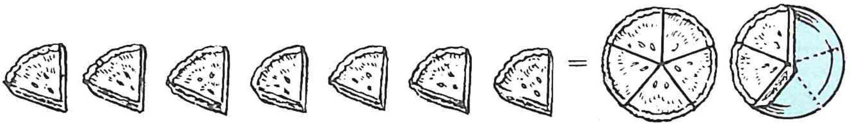


When Betty cut the whole pie into fourths and the half pie into halves, this would give each person $\frac{1}{4}$ of a pie. Why?

If each of the 6 persons had $\frac{1}{4}$ of a pie, this would be $\frac{6}{4}$.

$\frac{4}{4} = 1$ whole; $\frac{6}{4} = 1$ and $\frac{2}{4}$, or one and one-half pies. This can be written as $1\frac{1}{2}$. It is read one and one-half. $1\frac{1}{2}$ is a **mixed number**.

$\frac{5}{3} =$  , or $1\frac{2}{3}$.

$\frac{7}{5} =$  , or $1\frac{2}{5}$.

1. How many fourths are there in a whole? in $1\frac{1}{2}$ wholes?

2. How many eighths in 1 whole? in $1\frac{1}{4}$ wholes?

3. If a whole is to be cut into equal parts, how many fifths will there be in the whole?

4. Write each of these as a mixed number:

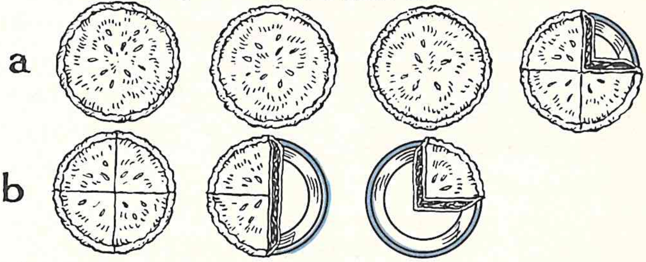
a.	**b.**	**c.**	**d.**	**e.**
$\frac{6}{4} = ?$	$\frac{9}{8} = ?$	$\frac{5}{4} = ?$	$\frac{7}{5} = ?$	$\frac{4}{3} = ?$

Meaning of a Mixed Number

Practice with Mixed Numbers

Edith and Betty know that a mixed number is one or more wholes and some additional fractional parts of a whole.

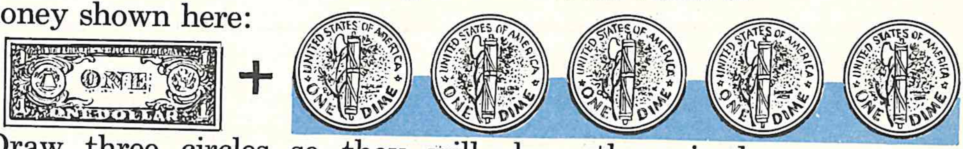
These are some of the problems they give each other to work:



1. Write a mixed number that tells how much pie there is altogether in picture A; in picture B.

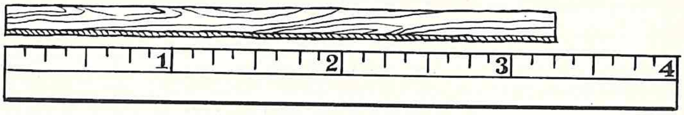
2. Write $5.25 as a mixed number.

3. Find a mixed number that gives the total value of the money shown here:



4. Draw three circles so they will show the mixed number $2\frac{3}{8}$.

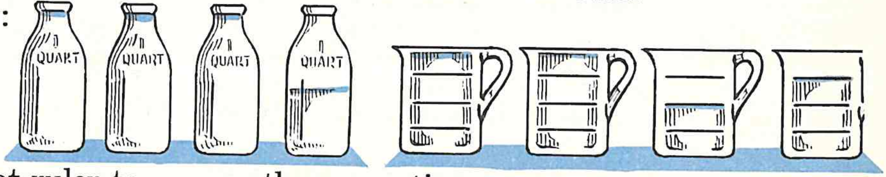
5. How would you read this measurement in inches? (It is a mixed number.)



6. Which is longer, $2\frac{1}{2}$ inches or $\frac{6}{2}$ inches? Why?

7. If you have a piece of wire that is 5 yd. and 2 ft. long, can this length be $5\frac{2}{3}$ yd.? Why?

8. Write the mixed number that is shown in each picture below:



9. Use a foot ruler to answer these questions:

a. How many inches are there in $1\frac{1}{4}$ ft.?

b. How many inches are there in $1\frac{1}{2}$ ft.?

c. How many inches are there in $1\frac{2}{3}$ ft.?

Pete Counts His Quarters

As soon as Pete washed the dishes, he got out the quarters he had been saving. He found that he had 7 quarters. He thought:

One quarter is $\frac{1}{4}$ of a dollar. Four quarters make $\frac{4}{4}$ of a whole dollar, and 7 quarters make $\frac{7}{4}$ dollars. Was Pete thinking correctly? Why?

1. If one quarter is $\frac{1}{4}$ of a dollar, would 3 quarters be $\frac{3}{4}$ of a dollar? Why?

2. What does $\frac{7}{4}$ mean?

3. Why is a dollar and a half-dollar equal to $\frac{3}{2}$ dollars?

4. How could you write 5 quarters in money as an improper fraction?

5. If Pete worked $2\frac{1}{2}$ hours on Friday afternoon for Mr. Brown, what improper fraction shows this amount of time?

6. What number in an improper fraction tells you the size of the fractional part that is being used? What number tells you how many of these parts you are using?

7. When you show that $2\frac{1}{4}$ has a value equal to $\frac{9}{4}$, what have you done to the 2 whole ones?

8. The mixed number $2\frac{1}{2}$ and the improper fraction $\frac{5}{2}$ have equal values. How can you tell that this is true?

9. Find which of the following are equal. Draw pictures to help in finding the answers:

a.	**b.**	**c.**	**d.**
$\frac{7}{4}$ and $1\frac{3}{4}$	$\frac{15}{3}$ and $4\frac{2}{3}$	$\frac{16}{5}$ and $3\frac{1}{5}$	$\frac{8}{2}$ and 4

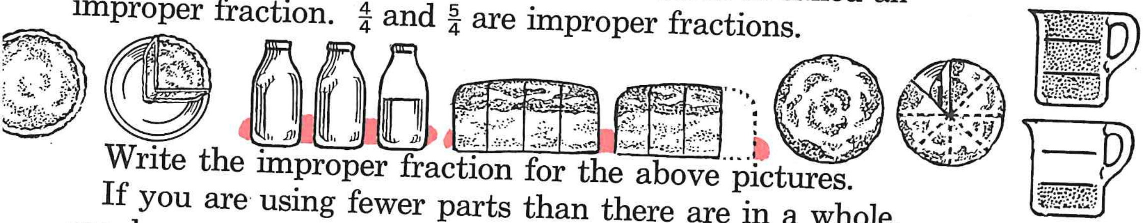
10. A dime is $\frac{1}{10}$ of a dollar. How many $\frac{1}{10}$'s are there in \$1.40?

11. A quarter is $\frac{1}{4}$ of a dollar. How many $\frac{1}{4}$ dollars are there in \$2.50?

12. Change \$1.75 to quarters, and tell how many $\frac{1}{4}$ dollars there are in this amount.

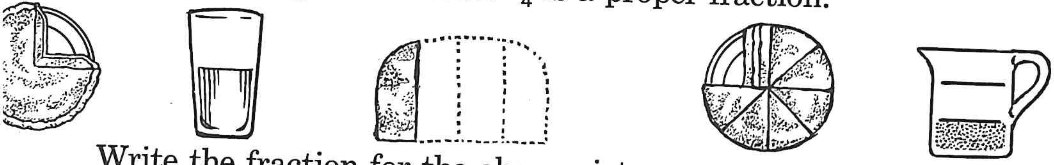
Practice with Improper Fractions

You have learned that a fraction in which you are using all the parts in a whole or more than a whole is called an improper fraction. $\frac{4}{4}$ and $\frac{5}{4}$ are improper fractions.



Write the improper fraction for the above pictures.

If you are using fewer parts than there are in a whole, you have a **proper fraction.** $\frac{3}{4}$ is a proper fraction.



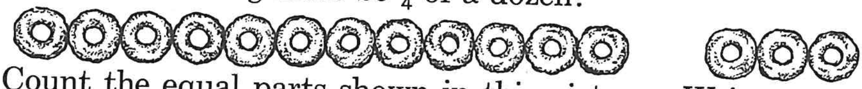
Write the fraction for the above pictures.

1. Tell which of these fractions are proper and which are improper:

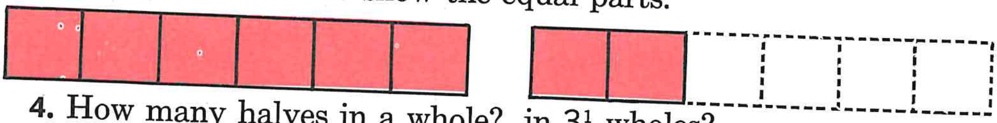
$\frac{9}{8}$ $\frac{5}{8}$ $\frac{11}{8}$ $\frac{3}{8}$ $\frac{7}{8}$ $\frac{1}{8}$ $\frac{8}{8}$ $\frac{15}{8}$

2. Remember the denominator of a fraction tells you how many parts in a whole. The numerator tells you how many of these parts you are using.

Why would 15 doughnuts be $\frac{5}{4}$ of a dozen?



3. Count the equal parts shown in this picture. Write the improper fraction to show the equal parts.



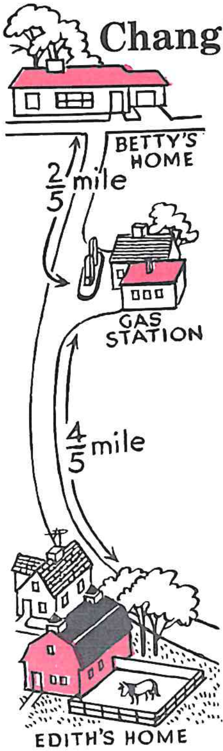
4. How many halves in a whole? in $3\frac{1}{2}$ wholes?

5. How many fourths in $3\frac{1}{4}$ wholes? Write this as an improper fraction.

6. Draw a picture showing $\frac{9}{4}$ as wholes and parts of wholes.

7. Draw a picture showing $\frac{8}{6}$ as wholes and parts of wholes.

Changing Improper Fractions to Mixed Numbers



Betty and her father took Edith home late Sunday afternoon. They stopped at the gas station on the way to Edith's home. It is $\frac{2}{5}$ mi. from Betty's home to the gas station, and $\frac{4}{5}$ mi. from the gas station to Edith's home. How far is it from Betty's home to Edith's home by way of the gas station?

This is the way Betty figured it:

She decided first to find how many $\frac{1}{5}$ mi. there were.

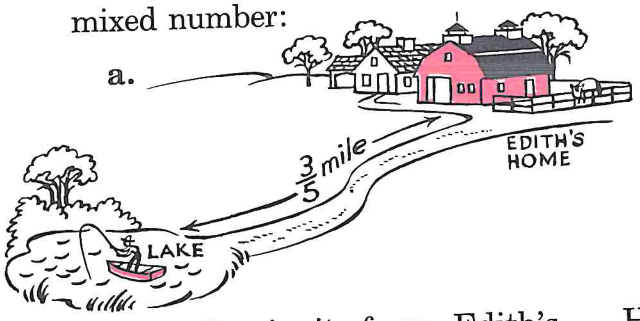
$\frac{2}{5} + \frac{4}{5} = \frac{6}{5}$ mi. Why? Betty knew that there were $\frac{5}{5}$ in a whole mile. (There are 5 fifths in any whole.) In $\frac{6}{5}$ there is 1 whole ($\frac{5}{5}$) and another $\frac{1}{5}$, or $1\frac{1}{5}$ miles.

Betty's father said he would wait while she and Edith took a fast ride on Edith's pony. It is $\frac{3}{8}$ of a mile to the gate and $\frac{7}{8}$ of a mile along the trail and back to the barn. How far did the girls ride?

$\frac{3}{8} + \frac{7}{8} = \frac{10}{8}$. Why? How many $\frac{1}{8}$'s are there in a whole? Then $\frac{10}{8} = 1$ whole and $\frac{?}{8}$. Betty thinks the answer is 1 mi. Is she right? Why?

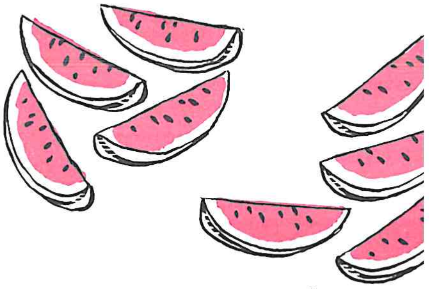
1. Study these pictures and answer the question under each picture, first writing the improper fraction, then the mixed number:

a.



How far is it from Edith's home to the lake and back?

b.

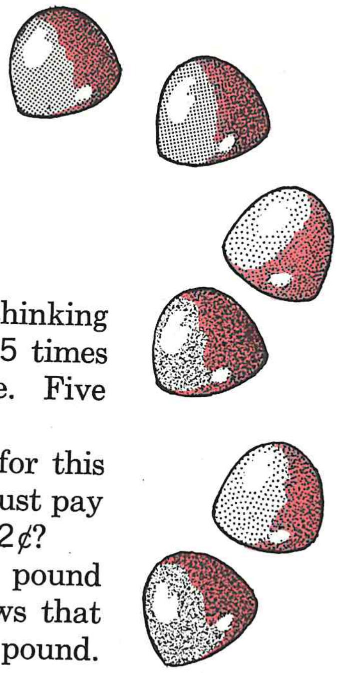


How many watermelons have been cut, if each watermelon was cut into 4 equal pieces?

2. Change these improper fractions to mixed numbers:

a. $\frac{6}{5}, \frac{10}{9}, \frac{8}{7}$ **b.** $\frac{5}{4}, \frac{4}{3}, \frac{11}{10}$ **c.** $\frac{3}{2}, \frac{9}{7}, \frac{6}{4}$

Larry Buys Gum Drops



Larry thinks that the gum drops they sell in the candy store are the best he has ever eaten. He picks out all the red ones first, because he likes their flavor best.

Larry bought $\frac{1}{4}$ pound of gum drops for 12¢. He ate all of them, but then he kept right on thinking how good they were. He decided he would buy 5 times that many, so he can have all he wants for once. Five one-fourth pounds = $\frac{5}{4}$ pounds.

Larry wants to be sure he has enough money for this many gum drops. He paid 12¢ for $\frac{1}{4}$ pound. He must pay 5 × 12¢ for $\frac{5}{4}$ pounds. Why? How much is 5 × 12¢?

Larry checks his answer by finding that $\frac{5}{4} = 1$ pound and $\frac{1}{4}$ pound, or $1\frac{1}{4}$ pound. ($\frac{4}{4} + \frac{1}{4} = \frac{5}{4}$). He knows that gum drops are 48¢ a pound ($\frac{4}{4}$), and also 12¢ for $\frac{1}{4}$ pound. 48¢ + 12¢ = 60¢.

1. Fill in the blanks and draw pictures to prove your answer.

a. $\frac{9}{8} = \frac{8}{8}$ in a whole + $\frac{?}{8}$, or $1\frac{?}{8}$.
b. $\frac{7}{4} = \frac{4}{4}$ in a whole + $\frac{?}{4}$, or $1\frac{?}{4}$.
c. $\frac{8}{5} = \frac{?}{5}$ in a whole + $\frac{?}{5}$, or ?.
d. $\frac{12}{4} = \frac{4}{4}$ in a whole + $\frac{?}{4}$ = ?.
e. $\frac{5}{3} = \frac{?}{3}$ in a whole + $\frac{?}{3}$, or ?.
f. $\frac{7}{6} = \frac{?}{6}$ in a whole + $\frac{?}{6}$ = ?.

2. Write these amounts as improper fractions in fourths:

1 3 $2\frac{1}{4}$ 4 $1\frac{1}{2}$ $2\frac{1}{2}$ $2\frac{3}{4}$ $1\frac{7}{4}$ 2

3. Write these amounts as improper fractions in halves:

2 4 $1\frac{1}{2}$ $2\frac{1}{2}$ 6 $5\frac{1}{2}$ $7\frac{1}{2}$ $3.50

4. Change to whole or mixed numbers:

$\frac{7}{3}$ $\frac{9}{7}$ $\frac{6}{3}$ $\frac{12}{10}$ $\frac{10}{4}$ $\frac{11}{3}$ $\frac{9}{6}$ $\frac{11}{5}$ $\frac{12}{5}$ $\frac{15}{8}$

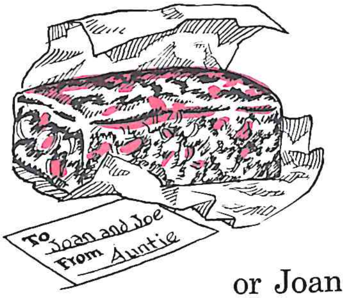
5. Which is more, $3\frac{1}{4}$ dozen or $\frac{7}{4}$ dozen oranges?

6. Arrange these values in order of size from the smallest to the largest:

a. $1\frac{1}{2}$ $\frac{5}{4}$ $\frac{11}{8}$

b. $1\frac{1}{3}$ $1\frac{5}{6}$ $\frac{7}{6}$

c. $1\frac{3}{4}$ $\frac{5}{2}$ $1\frac{7}{6}$

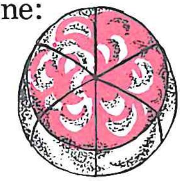


Who Is Right?

Joan and Joe are twins. Joe says he gets $\frac{1}{2}$ of the fruit cake his aunt sent to them. Joan says he gets $\frac{2}{4}$. (The fruit cake is to be divided equally between him and his sister.) Who is right, Joe or Joan? Could both of them be right? Draw a picture of this fruit cake, and divide it equally.

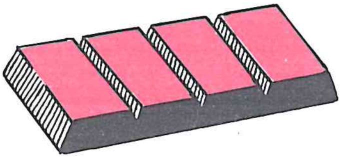
1. Study these pictures and answer the questions below each one:

a



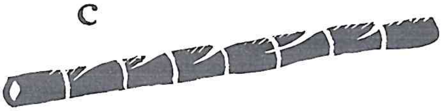
$\frac{1}{2} = \frac{?}{6}$ $\frac{1}{3} = \frac{?}{6}$

b



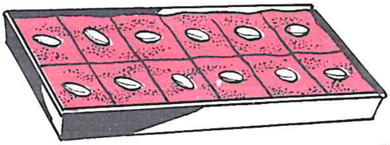
$\frac{1}{2} = \frac{?}{4}$ 1 whole $= \frac{?}{4}$

c



$\frac{2}{8} = \frac{?}{4}$ $\frac{1}{2} = \frac{?}{8}$

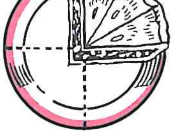
d



$\frac{3}{4} = \frac{?}{12}$ $\frac{1}{2} = \frac{?}{12}$ $\frac{3}{12} = \frac{?}{4}$

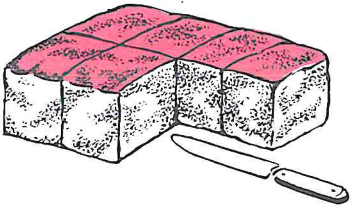
2. Give another fraction that is equal to each of these fractional parts:

a



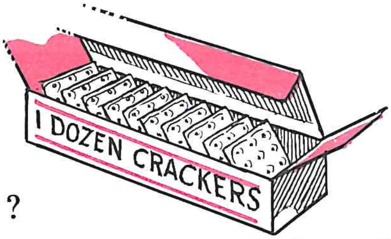
$\frac{3}{12} = ?$

b



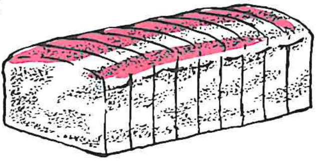
$\frac{6}{8} = ?$

c



$\frac{10}{12} = ?$

d

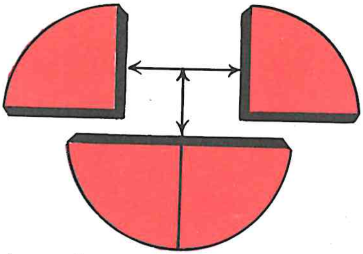


$\frac{3}{9} = \frac{?}{3}$ $\frac{6}{9} = \frac{?}{3}$

3. Divide a pie that you have drawn into 6 equal parts. What is each part called? Then, $\frac{4}{6} = \frac{?}{3}$, $\frac{6}{6} = ?$, and $\frac{3}{6} = \frac{?}{2}$.

Reducing Fractions

Adding Fractions



$$\begin{array}{r}\frac{1}{4}\\ +\frac{1}{4}\\ \hline \frac{2}{4}=\frac{1}{2}\end{array}$$

$$\frac{1}{4}+\frac{1}{4}=\frac{2}{4}$$
$$\frac{2}{4}=\frac{1}{2}$$

Add these fractions; draw a picture to prove your answers:

	a.	b.	c.	d.
1.	$\frac{2}{8} + \frac{2}{8}$	$\frac{1}{3} + \frac{1}{3}$	$\frac{2}{4} + \frac{1}{4}$	$\frac{3}{8} + \frac{3}{8}$
2.	$\frac{3}{6} + \frac{1}{6}$	$\frac{1}{8} + \frac{1}{8}$	$\frac{3}{4} + \frac{1}{4}$	$\frac{1}{6} + \frac{1}{6}$
3.	$\frac{3}{6} + \frac{2}{6}$	$\frac{3}{8} + \frac{4}{8}$	$\frac{2}{6} + \frac{1}{6}$	$\frac{4}{5} + \frac{1}{5}$

4. Mary has $\frac{1}{2}$ yd. of red cloth and $\frac{1}{2}$ yd. of blue cloth. How much cloth does she have in all?

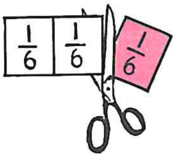
5. Jenny bought $\frac{1}{3}$ yd. to add to the $\frac{1}{3}$ yd. she already had. How much cloth did she have altogether?

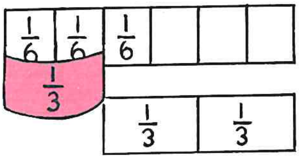
6. Jenny bought $\frac{1}{8}$ yd. of lace. Then she found she needed $\frac{3}{8}$ yd. more. How much lace did she need altogether?

7. Pete thought he needed a piece of wire $3\frac{1}{4}$ in. long. Then he found that the piece had to be $\frac{3}{4}$ in. longer. How long a piece did he need?

8. Pete is making a key chain. It is $1\frac{1}{8}$ in. long now. He is going to add $2\frac{7}{8}$ in. to it. How long will it be when he is finished?

Subtracting Fractions





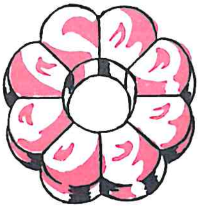
$$\begin{array}{r} \frac{3}{6} \\ -\ \frac{1}{6} \\ \hline \frac{2}{6} = \frac{1}{3} \end{array} \qquad \begin{array}{l} \frac{3}{6} - \frac{1}{6} = \frac{2}{6} \\ \frac{2}{6} = \frac{1}{3} \end{array}$$

Subtract these fractions, and draw a picture to prove your answer.

	a.	**b.**	**c.**	**d.**
1.	$\frac{4}{6} - \frac{1}{6}$	$\frac{3}{8} - \frac{1}{8}$	$\frac{2}{3} - \frac{1}{3}$	$\frac{4}{7} - \frac{3}{7}$
2.	$\frac{5}{9} - \frac{2}{9}$	$\frac{5}{6} - \frac{1}{6}$	$\frac{7}{8} - \frac{1}{8}$	$\frac{4}{5} - \frac{3}{5}$
3.	$\frac{6}{8} - \frac{1}{8}$	$\frac{3}{9} - \frac{2}{9}$	$\frac{6}{12} - \frac{4}{12}$	$\frac{8}{9} - \frac{2}{9}$

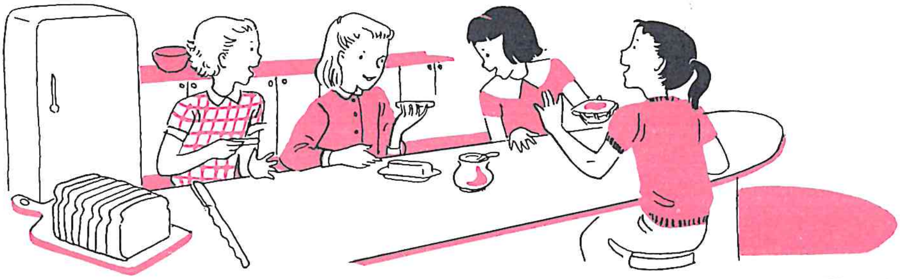
4. Jane cut an apple into 4 equal pieces. What is each part called? She gave 3 of these pieces to her friends. How many $\frac{1}{4}$'s does she have left? (Show your work.)

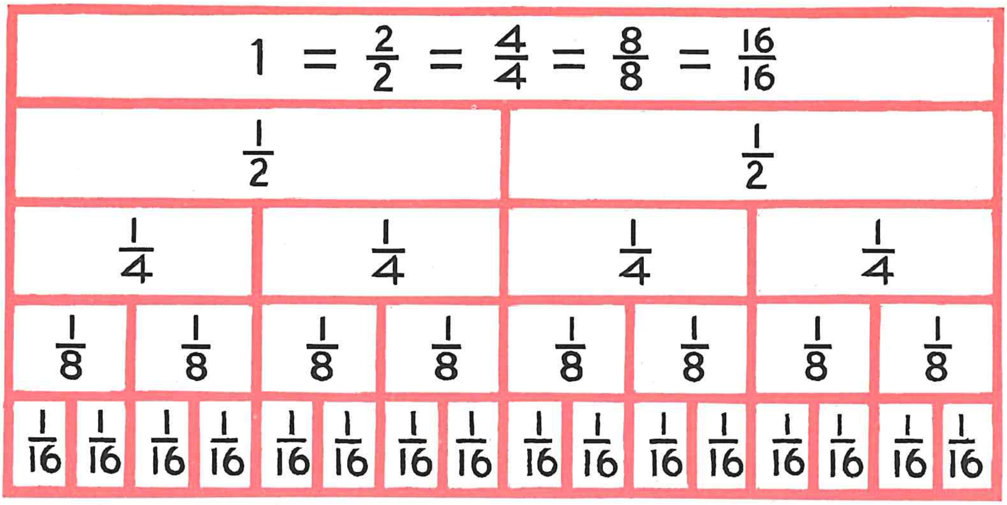
5. Jane was still hungry after she ate part of the apple. She found a pie in the kitchen. It had been cut into 6 equal pieces. Four of the pieces were left. What fractional part of the pie is left? Draw a picture, and give the fractions to show your figuring.



6. Jane saw this salad in the refrigerator. If she and her 3 friends each had a helping, how much of the salad would be left? (Show the figuring.)

7. This loaf of bread has been cut into twelfths. Jane and her friends each had a piece. What fractional part of the loaf did they eat? What fractional part of the loaf is left? (Show the figuring.)





$1 = \frac{2}{2} = \frac{4}{4} = \frac{8}{8} = \frac{16}{16}$
$\frac{1}{2}$ $\frac{1}{2}$
$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$
$\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$
$\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$ $\frac{1}{16}$

Comparing Values

1. Are the figures in the top row in this diagram correct? Why? Write as many other pairs of equal values as you can find.

2. Make another chart similar to this one, starting with 1 and dividing it into thirds and then halves of thirds. Next, give a row where thirds are divided into thirds and one where thirds are divided into fourths.

3. If you study $1\frac{2}{3}$ hours and your friend studies $1\frac{3}{4}$ hours each night, who studies the longer time? Can you use the diagram given you and the one you made to prove your answer?

4. Which is more, $1\frac{5}{6}$ dozen or $1\frac{3}{4}$ dozen?

5. Use the diagrams to show that $\frac{1}{4} = \frac{3}{12}$; that $\frac{3}{4} = \frac{9}{12}$.

6. Show that $\frac{9}{12} = \frac{7}{16}$ by using the diagrams; then prove you are right by changing the fractions to larger parts.

7. If you change a half-dollar into quarters, what fractional parts of a dollar will show what you did?

8. Draw lines with your ruler to prove that $3\frac{1}{2}$ in. = $\frac{7}{2}$ in.

9. How many $\frac{1}{2}$-inch lengths are there in 3 inches? in $2\frac{1}{2}$ inches?

Unit Review

1. What does the denominator of a fraction tell you? the numerator?

2. Tell which one of the following parts is larger:

$\frac{1}{2}$ or $\frac{3}{8}$ $\qquad$ $\frac{2}{3}$ or $\frac{4}{6}$ $\qquad$ $\frac{1}{2}$ or $\frac{1}{3}$

3. What part of a dollar is 10¢? is 30¢?

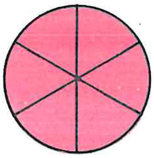
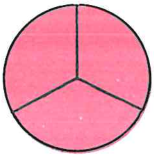
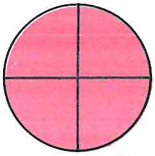
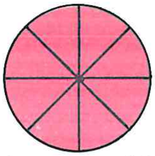
4. Change $1\frac{3}{8}$ to eighths (improper fraction).

5. How many whole yards are there in $\frac{8}{3}$ yards? How many thirds are left over? Write the mixed number.

6. Why is $3\frac{1}{4}$ called a mixed number?

7. Why is $\frac{11}{4}$ called an improper fraction?

8. Which of these graphs could you use to show that you spend $\frac{1}{3}$ of your allowance for school lunches? Which one could you use to show you spent $\frac{1}{4}$ of it for carfare?

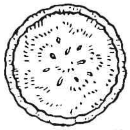
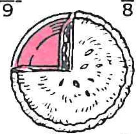
9. How many ounces in $\frac{1}{4}$ of a pound? in $\frac{3}{4}$ of a pound?

10. Change these to improper fractions:

$2\frac{1}{4}$ $\qquad$ $6\frac{1}{2}$ $\qquad$ $4\frac{1}{3}$ $\qquad$ $1\frac{3}{8}$ $\qquad$ $2\frac{1}{6}$

11. Change these to mixed numbers:

$\frac{12}{9}$ $\qquad$ $\frac{9}{8}$ $\qquad$ $\frac{5}{4}$ $\qquad$ $\frac{7}{3}$ $\qquad$ $\frac{8}{3}$ $\qquad$ $\frac{7}{5}$

12. Mrs. Allen had the pie in the picture left over from dinner. How much pie was left?

13. Does changing from thirds to sixths give you larger or smaller parts? Why?

14. Make drawings of these amounts:

a. Draw a picture of a square pan of gingerbread, and divide it into eighths. How much is $\frac{1}{8} + \frac{5}{8}$?

b. Draw a pie and divide it into sixths. How much is $\frac{5}{6} - \frac{1}{6}$?

c. Draw a bar of baking chocolate, and divide it into sixteenths ($\frac{1}{16}$'s). $\frac{3}{16} + \frac{5}{16} = \frac{?}{8}$; $\frac{9}{16} - \frac{5}{16} = \frac{?}{4}$.

Unit Test

Fill the blanks (draw pictures if you need them):

	a.	b.	c.
1.	$\frac{2}{4} = \frac{?}{2}$	$\frac{4}{6} = \frac{?}{3}$	$\frac{4}{8} = \frac{?}{2}$
2.	$\frac{2}{6} = \frac{?}{3}$	$\frac{6}{12} = \frac{?}{2}$	$\frac{6}{9} = \frac{?}{3}$
3.	$\frac{2}{16} = \frac{?}{8}$	$\frac{6}{8} = \frac{?}{4}$	$\frac{2}{12} = \frac{?}{6}$
4.	$\frac{4}{10} = \frac{?}{5}$	$\frac{3}{9} = \frac{?}{3}$	$\frac{10}{12} = \frac{?}{6}$

5. Which would you rather have, $\frac{1}{8}$ or $\frac{1}{4}$ of a dollar? Why?

6. How many things in $\frac{1}{4}$ of a dozen? in $\frac{1}{3}$ of a dozen?

7. How many minutes are there in a quarter of an hour? in three-quarters of an hour?

8. Doughnuts are 30¢ a dozen. How much must you pay for $2\frac{1}{2}$ dozen?

9. Find the price of one button when a dozen of them costs 48¢.

Add these fractions:

	a.	b.	c.	d.
10.	$\frac{1}{4} + \frac{1}{4}$	$\frac{2}{8} + \frac{1}{8}$	$\frac{4}{5} + \frac{1}{5}$	$\frac{6}{8} + \frac{1}{8}$
11.	$\frac{3}{5} + \frac{1}{5}$	$\frac{2}{8} + \frac{4}{8}$	$\frac{5}{9} + \frac{1}{9}$	$\frac{1}{3} + \frac{1}{3}$
12.	$\frac{2}{4} + \frac{1}{4}$	$\frac{1}{8} + \frac{6}{8}$	$\frac{1}{5} + \frac{3}{5}$	$\frac{1}{9} + \frac{1}{9}$

Subtract these fractions:

13.	$\frac{6}{8} - \frac{4}{8}$	$\frac{2}{3} - \frac{1}{3}$	$\frac{4}{5} - \frac{2}{5}$	$\frac{7}{8} - \frac{6}{8}$
14.	$\frac{4}{9} - \frac{2}{9}$	$\frac{7}{12} - \frac{1}{12}$	$\frac{3}{10} - \frac{1}{10}$	$\frac{8}{9} - \frac{5}{9}$
15.	$\frac{4}{12} - \frac{1}{12}$	$\frac{3}{4} - \frac{2}{4}$	$\frac{8}{10} - \frac{3}{10}$	$\frac{6}{7} - \frac{2}{7}$

16. Find the missing numbers in these, and draw pictures to prove your answers:

$\frac{1}{6} = \frac{?}{12}$ $\qquad$ $\frac{1}{4} = \frac{?}{8}$ $\qquad$ $\frac{2}{5} = \frac{?}{10}$ $\qquad$ $\frac{6}{8} = \frac{?}{4}$

UNIT 7

Pioneer Days

The boys and girls in the fifth grade have been studying about the pioneers. They are going to churn butter as the pioneers did. Each boy and girl brought a half-pint of cream. But what are they going to use for a churn if no one has one of the old kind? Steven wasn't sure they would get butter, but they did!

The girls have sewing bees, so they can get all their sewing done. They had a hard time trying to decide which of the quilt patterns they thought was the prettiest. When you come to it, you can decide if you would choose the same pattern they did.

The girls did some weaving too, and the boys made the hand looms for them to use. The boys put the nails in just the right places, so the woven pieces looked fine when they were finished. There were samplers to make for the walls. Ellen did hers in many bright colors.

Then the boys each made a musket. The boys knew the muskets the pioneers used were very long, so they had to make some of them out of pieces of wood wired together to make them long enough.

Everyone made candles by dipping the wicks into tallow. Everybody got a candle for his own. The boys made a box for the candles that were left over and kept at school.

If you were going to have a sewing bee at your house and serve refreshments, what would you have to know about numbers? Could you figure out how many quarts of punch you would need if each of 8 girls were to have 2 glasses each?

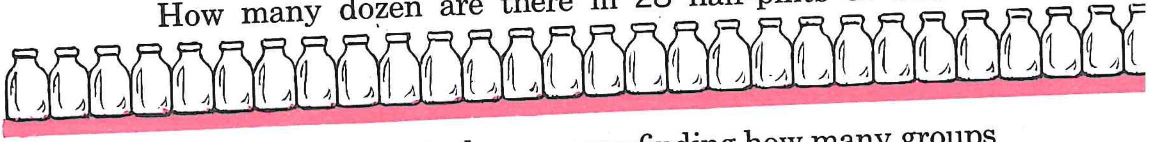
Bill needs a piece of wood 1 foot long for the stock of his musket. The only piece he can find is $\frac{2}{3}$ ft. long. How much too short is this piece? If you do not know, this is one of the things you will learn in this unit.

Getting Ready to Make Butter

Everyone is so excited about making butter. No one will say so out loud, but some of the boys and girls are not sure they can get butter just by churning cream!

No one knew where they could borrow a churn, so they are going to use bowls and egg beaters. Then everyone can help churn by turning the egg beater.

Each of the 28 children brought a half-pint of cream. How many dozen are there in 28 half-pints of cream?



A dozen is a part when you are finding how many groups of 12 there are in 28.

What part of a dozen are the 4 half-pints that are left over? (Think how many 4's there are in 12.)

Do you see that $\frac{1}{4}$ of a dozen can be a part also if you are finding how many groups of 12 you have?

How many half-pints are there in $\frac{1}{12}$ of a dozen? in $\frac{3}{12}$? in $\frac{9}{12}$?

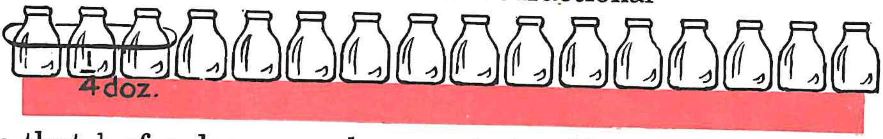
The boys and girls are going to work in groups of 4, so they can have turns helping churn. They need to know how many bowls they must borrow from the school kitchen.

There are 28 children, and they are going to work in groups of 4 each. How many bowls will they need? (How many 4's are there in 28?)

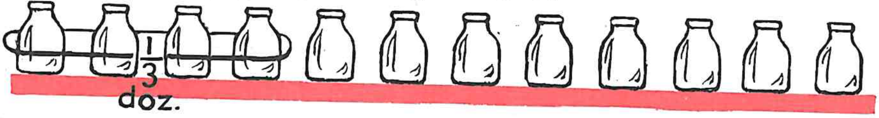
If each of the 7 groups of children is going to have an equal amount of cream, they must divide the half-pints equally. They will find the $\frac{1}{7}$ fractional part of 28. Do you see that this is finding the size of 1 part when there are 7 parts in 28? How many half-pints may each group have?

Dividing the Cream

The boys and girls could have divided the half-pints equally by using a dozen at a time. Four is what fractional part of 12?



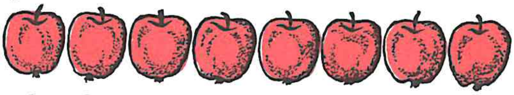
Do you see that $\frac{1}{3}$ of a dozen can be a part also, if you are finding how many groups of 4 you have?

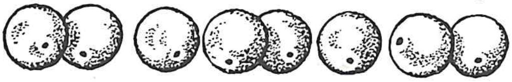


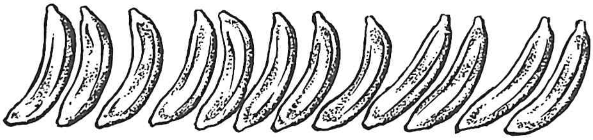
To find $\frac{1}{4}$ of these half-pints, you divide the whole into 4 equal parts ($4\overline{)16}$).

$\frac{3}{4}$ would be 3 of the $\frac{1}{4}$ parts = ?. Why?

Practice in finding parts of wholes:







1. Find $\frac{1}{4}$ of this group of apples.
   Find $\frac{2}{4}$ of the apples.
2. Find $\frac{4}{8}$ of this group of oranges.
   Find $\frac{2}{4}$ of the oranges.
3. Find $\frac{1}{3}$ of a dozen bananas.
   Find $\frac{4}{12}$ of a dozen.

Add:

	a.	b.	c.	d.	e.	f.	g.	h.
1.	$\frac{1}{4}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{1}{2}$	$\frac{1}{3}$ $\frac{1}{3}$	$\frac{1}{5}$ $\frac{2}{5}$	$\frac{1}{8}$ $\frac{3}{8}$	$\frac{1}{4}$ $\frac{2}{4}$	$\frac{1}{12}$ $\frac{7}{12}$	$\frac{2}{8}$ $\frac{2}{8}$
2.	$\frac{2}{8}$ $\frac{1}{8}$	$\frac{1}{10}$ $\frac{1}{10}$	$\frac{2}{5}$ $\frac{2}{5}$	$\frac{4}{10}$ $\frac{1}{10}$	$\frac{3}{12}$ $\frac{1}{12}$	$\frac{1}{6}$ $\frac{1}{6}$	$\frac{2}{3}$ $\frac{1}{3}$	$\frac{2}{6}$ $\frac{1}{6}$

Subtract:

3.	$\frac{3}{4}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{1}{2}$	$\frac{5}{8}$ $\frac{2}{8}$	$\frac{5}{9}$ $\frac{2}{9}$	$\frac{1}{12}$ $\frac{1}{12}$	$\frac{5}{6}$ $\frac{2}{6}$	$\frac{4}{8}$ $\frac{1}{8}$	$\frac{2}{4}$ $\frac{1}{4}$
4.	$\frac{5}{8}$ $\frac{1}{8}$	$\frac{2}{3}$ $\frac{1}{3}$	$\frac{8}{9}$ $\frac{3}{9}$	$\frac{4}{5}$ $\frac{1}{5}$	$\frac{6}{7}$ $\frac{1}{7}$	$\frac{1}{9}$ $\frac{1}{9}$	$\frac{7}{8}$ $\frac{1}{8}$	$\frac{10}{12}$ $\frac{2}{12}$

Practice in Finding Equal Parts

Finding How Much Cream

Miss Bonn said, "You can churn butter the last hour after the arithmetic period. There are some things that we should do first. We need to know more about measuring cream." Miss Bonn got an empty half-pint and a pint bottle and had some measuring done. Joe filled the half-pint with water to find how many half-pints it took to fill a pint. Before you do this yourself, think how much one half-pint and another half-pint would be. What is your answer?

How many half-pints are there in a quart? (To check your answer, think how many half-pints there are in a pint; then think how many pints there are in a quart.)

A half-pint is what fractional part of a quart?

How many quarts of cream do the children have in 28 half-pints? First, think how many half-pints it takes to make a quart; then figure how many quarts 28 half-pints would make.

The children would like to know if they had as much as a gallon of cream.

How many quarts do they have?

How many quarts are there in a gallon?

At last it was time to churn the butter. They poured the cream into the bowls. Jane said, "We had cream in 28 containers before we changed to larger parts. Now we have cream in only 7 containers."

Bob said, "Yes, but if we poured the cream from the 7 bowls back into the small containers, we would have 28 half-pints again."

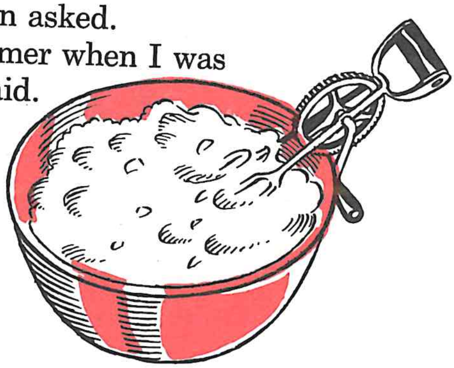
8 pints = ? quarts   12 quarts = ? gal.   3 gal. = ? pints

Churning Butter

Everyone put on his apron and gathered around the bowl as the children poured the half-pints of cream into the bowl.

"I wonder if we will get butter?" Steven asked.

"I saw my grandmother churn one summer when I was visiting her, and she got butter," Mary said.



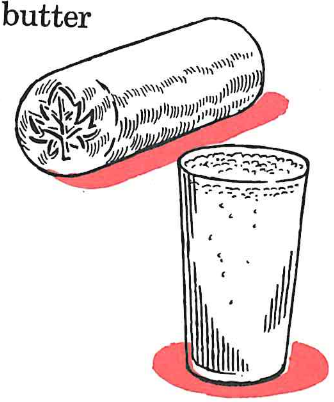
The children took turns churning. At first the cream looked just as it did when they poured it in. After a while, it began to thicken until it looked like this with little specks of butter showing.

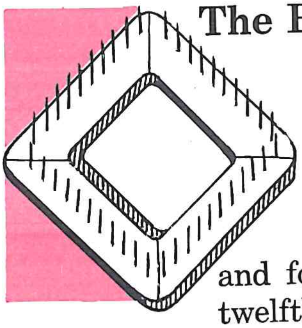
Then it began to thicken much faster until little specks of butter gathered with other specks to make larger pieces of butter. Soon there was just butter and buttermilk in the bowl.

The children took wooden ladles and patted the butter into a roll. Then they made a design on top of it.

1. Divide this roll of butter into 4 equal parts. What is each part called?

2. They poured the buttermilk into a glass. Divide this glass of buttermilk into 4 equal parts. What part of a glass will each of 4 children receive if each gets an equal amount?

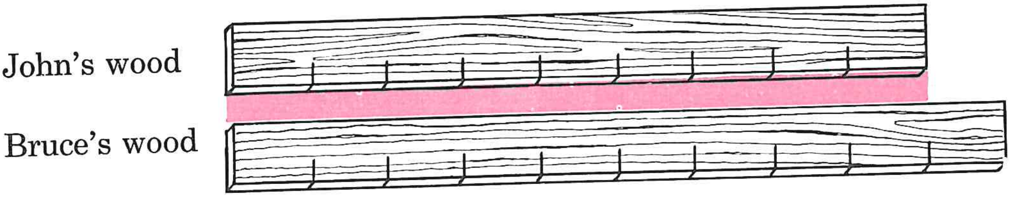




The Boys Make Looms for the Girls to Use

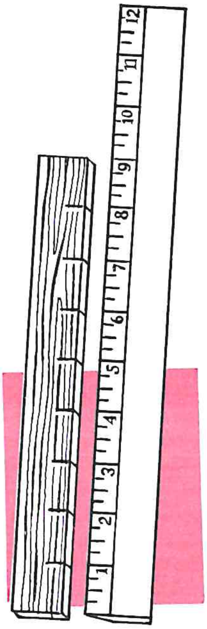
The boys are making simple looms for the girls. John brought pieces of wood for the looms. The looms are to be the same size. John measured one piece of wood and found that it was 9 in. long. Write this length in twelfths of a foot.

Bruce measured his piece of wood and found it was 10 in. long. Write this length in twelfths of a foot ($\frac{?}{12}$).



How much must Bruce cut from his wood to make it the same length as the one that John has?

Miss Bonn said that $\frac{9}{12}$ and $\frac{10}{12}$ were **like fractions.** Like fractions are those in which the *denominators are the same*, such as $\frac{9}{12}$ and $\frac{10}{12}$, or $\frac{2}{9}$ and $\frac{7}{9}$.



Ben said his piece of wood, shown at the left, was $\frac{3}{4}$ of a foot long. Was he right?

Miss Bonn said that $\frac{3}{4}$ and $\frac{9}{12}$ are **unlike fractions.** Unlike fractions are those in which the *denominators are different*: $\frac{3}{4}$ and $\frac{9}{12}$; $\frac{2}{3}$ and $\frac{5}{9}$.

1. Tell which of these pairs are like fractions and which are unlike fractions:

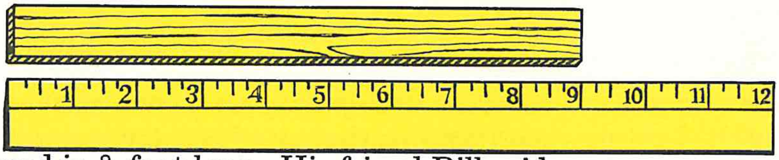
a. $\frac{7}{8}$; $\frac{1}{2}$	**b.** $\frac{2}{3}$; $\frac{1}{3}$	**c.** $\frac{1}{6}$; $\frac{5}{6}$
d. $\frac{1}{12}$; $\frac{6}{12}$	**e.** $\frac{2}{5}$; $\frac{1}{3}$	**f.** $\frac{1}{8}$; $\frac{1}{4}$

2. Add these like fractions:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
$\frac{1}{4}$	$\frac{2}{6}$	$\frac{5}{8}$	$\frac{1}{7}$	$\frac{1}{5}$	$\frac{1}{9}$	$\frac{1}{6}$
$\frac{1}{4}$	$\frac{3}{6}$	$\frac{2}{8}$	$\frac{2}{7}$	$\frac{3}{5}$	$\frac{1}{9}$	$\frac{4}{6}$

Making the Looms

Jimmy cut his 4 pieces of wood the same length. How long is this piece of wood?



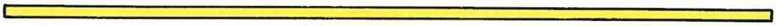
Jimmy said the wood is $\frac{9}{12}$ foot long. His friend Bill said it is $\frac{3}{4}$ foot long. Which boy is right?

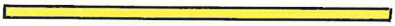
Do you see that $\frac{3}{4}$ and $\frac{9}{12}$ are unlike fractions but have the same value?

1. Write the lengths of these distances as two fractions having equal value (such as $\frac{3}{4}$ and $\frac{9}{12}$):

a. 6 in.	**b.** 9 in.	**c.** 2 in.
d. 4 in.	**e.** 8 in.	**f.** 3 in.

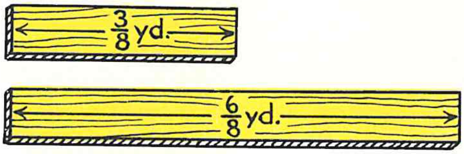
2. Use your foot ruler to find these lengths. Give each length as two fractions of equal value:

a. 

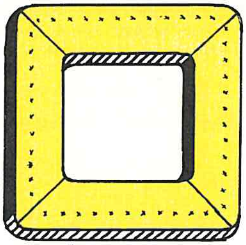
b. 

3. Draw a line 1 in. long. Divide it to show that $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$.

4. What is the difference between the lengths shown at the right? How many of the smaller pieces of wood would it take to equal the longer piece?


$\frac{3}{8}$ yd.
$\frac{6}{8}$ yd.

5. Jimmy has his frame made, and he is ready to drive the nails. He wants the nails to be $\frac{1}{8}$ in. apart. How many nails will he drive in an inch length? in a $\frac{1}{2}$ in. length? in a $\frac{1}{4}$ in. length?



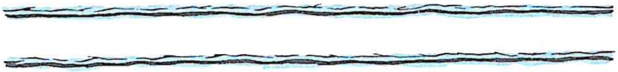
6. Draw a square on your paper. Use a blue crayon to divide it into four equal parts ($\frac{1}{4}$). Use a red crayon to divide each $\frac{1}{4}$ into two equal parts. $\frac{4}{8} = \frac{1}{?}$

Weaving a Bed Spread

The girls are very pleased with the looms the boys made for them. Each one of the girls is going to weave one block, and then they will be sewn together to make a bed spread.

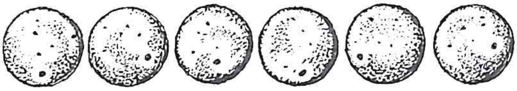
Betsy uses strands of yarn that are $\frac{2}{3}$ yd. long. Jane uses strands that are $\frac{8}{12}$ yd. long. Do these unlike fractions have equal value?

Betsy's piece:
Jane's piece:

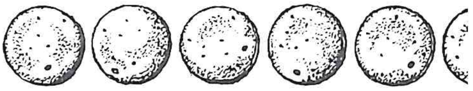


1. Do these unlike fractions have the same value?

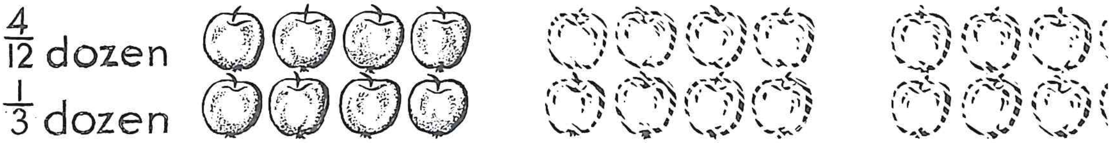
$\frac{1}{2}$ doz. oranges



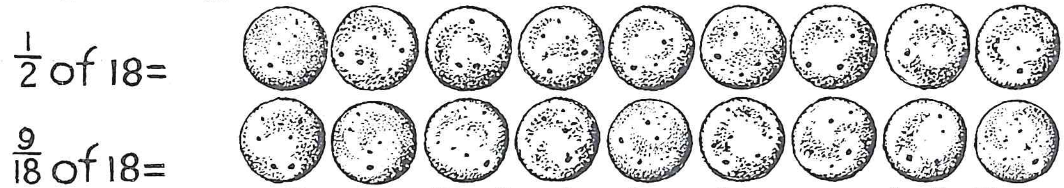
$\frac{6}{12}$ doz. oranges



$\frac{4}{12}$ doz., $\frac{1}{3}$ doz.



$\frac{1}{2}$ of 18, $\frac{9}{18}$ of 18

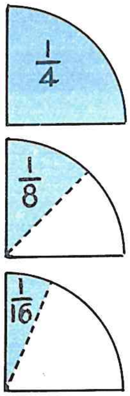


2. Do these like fractions have the same value? Draw pictures to prove your answer.

$\frac{3}{8}$ and $\frac{5}{8}$ $\frac{4}{5}$ and $\frac{5}{5}$ $\frac{1}{3}$ and $\frac{2}{3}$ $\frac{4}{8}$ and $\frac{6}{8}$

3. Draw fourths like those at the left, and show how to make like fractions out of $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{1}{16}$.

4. Draw a square, and divide it to prove that $1 = \frac{4}{4}$. Is this making a fraction out of a whole number?



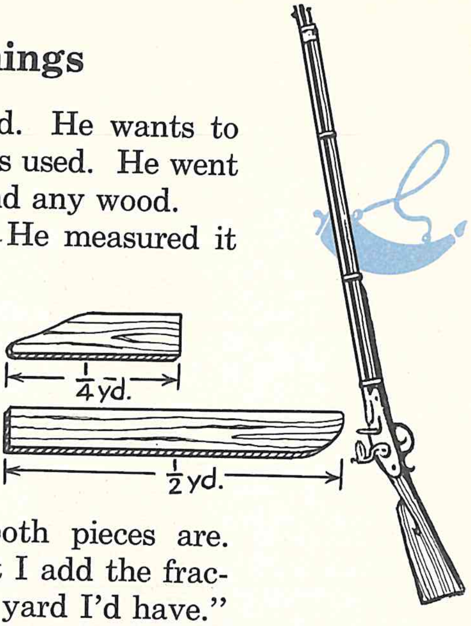
Bill Likes to Make Things

Bill likes to make things out of wood. He wants to make a musket like the ones the pioneers used. He went out to the workshop to see if he could find any wood.

He found a fine piece of pine wood. He measured it and found that it was 18 in. ($\frac{1}{2}$ yd.) long.

Bill knew this piece would do for part of the breech, but he must find another piece to fasten to it to make the breech long enough.

He found another piece on the work bench which measured 9 in. ($\frac{1}{4}$ yd.) long. He wants to know how long both pieces are. (18 in. + 9 in. = ?) He said, "Why don't I add the fractions? That would give me the part of a yard I'd have."



$\frac{1}{4}$ yd.
$\frac{1}{2}$ yd.

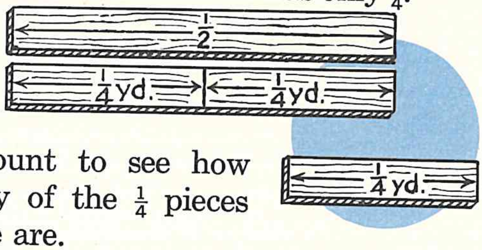
$$\begin{array}{r} \frac{1}{4} \\ +\frac{1}{2} \\ \hline \end{array}$$

He sees at once that he cannot add halves and fourths until he changes one or both fractions to **common parts** (the same sized fractional parts). He cannot change $\frac{1}{4}$ to halves because he has only $\frac{1}{4}$.

But he can change $\frac{1}{2}$ to $\frac{2}{4}$.

Now he can add:

$$\begin{array}{r} \frac{1}{4} \\ +\frac{1}{2} \\ \hline \end{array} \quad = \quad \begin{array}{r} \frac{1}{4} \\ +\frac{2}{4} \\ \hline \frac{3}{4} \end{array}$$

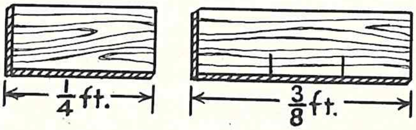


Count to see how many of the $\frac{1}{4}$ pieces there are.

The two pieces of wood make a piece that is $\frac{3}{4}$ yd. long.

Before you can work with unlike fractions, you should find the **largest** common part. To find the largest common part, you must find the parts into which one or both fractions may be changed to have the same sized fractional parts.

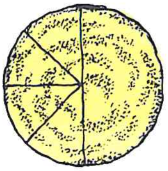
Look at the picture, and find the largest common part in the fractions $\frac{1}{4}$ and $\frac{3}{8}$.



Practice in Finding the Largest Common Part

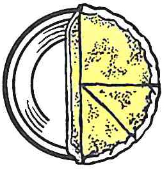
1. Study these groups of pictures, and find the largest common part into which one of these fractions can be changed so that there are the same sized fractional parts.

a.



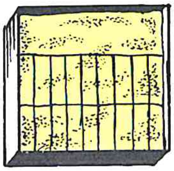
The largest common part is ?.

b.



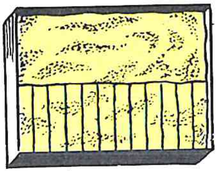
The largest common part is ?.

c.



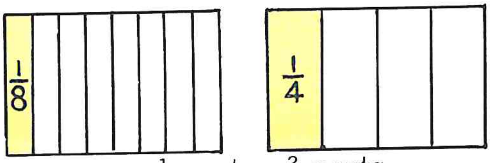
The largest common part is ?.

d.



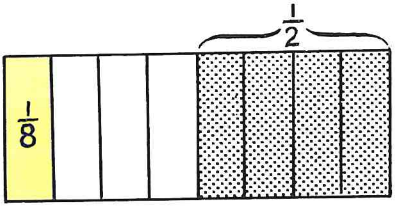
The largest common part is ?.

2. You know that the larger the denominator in a fraction, the smaller the part. You can see that one-eighth ($\frac{1}{8}$) is smaller than one-fourth ($\frac{1}{4}$). What is the largest common part that can be found in these two pictures?



$\frac{1}{4}$ part = $\frac{2}{8}$ parts

The largest common part in two or more fractions is called the **lowest common denominator**.



3. Look at this picture and tell why the *largest* common fractional part is also the *lowest* common denominator.

4. What is the lowest common denominator in the fractions $\frac{1}{2}$ and $\frac{1}{8}$?

The words *lowest common denominator* are shortened by using the letters **L.C.D.**

5. Find the L.C.D. in these pairs of fractions:

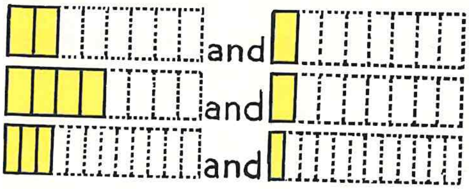
a. $\frac{1}{2}$ and $\frac{2}{8}$

b. $\frac{1}{3}$ and $\frac{5}{6}$

c. $\frac{1}{9}$ and $\frac{2}{3}$

Practice in Finding the L.C.D.

1. These pictures will help you to change one of these fractions to the lowest common denominator, so you will have like fractions:



a. $\frac{1}{4}$ and $\frac{1}{8}$ $\quad \frac{1}{4} = ?\ \frac{1}{8} = ?$

b. $\frac{1}{2}$ and $\frac{1}{8}$ $\quad \frac{1}{2} = ?\ \frac{1}{8} = ?$

c. $\frac{1}{4}$ and $\frac{1}{12}$ $\quad \frac{1}{4} = ?\ \frac{1}{12} = ?$

2. Changing to like fractions (same sized fractional parts) gives a common denominator. This means that the denominators will be the same.

Change these fractions to the lowest common denominator.

a. $\frac{1}{2} = ?$ $\quad \frac{1}{6} = ?$

b. $\frac{1}{3} = ?$ $\quad \frac{5}{6} = ?$

c. $\frac{1}{4} = ?$ $\quad \frac{2}{12} = ?$

d. $\frac{1}{5} = ?$ $\quad \frac{3}{10} = ?$

e. $\frac{1}{9} = ?$ $\quad \frac{1}{3} = ?$

f. $\frac{5}{12} = ?$ $\quad \frac{1}{3} = ?$

g. $\frac{3}{4} = ?$ $\quad \frac{3}{8} = ?$

h. $\frac{1}{9} = ?$ $\quad \frac{5}{18} = ?$

3. Look at the exercise below:

$$\begin{array}{r} \frac{1}{2} = \frac{?}{8} \\ +\frac{1}{8} = \frac{?}{8} \\ \hline \end{array}$$

Why is 8 a common denominator?
Is 8 the L.C.D.?
Add to find the answer after you have changed the fractions to the L.C.D.

4. Could you use the common denominator of 16? Would it be the L.C.D.?

$$\begin{array}{r} \frac{1}{2} = \frac{?}{16} \\ +\frac{1}{8} = \frac{?}{16} \\ \hline \end{array}$$

How many sixteenths in $\frac{1}{2}$?
How many sixteenths in $\frac{1}{8}$?
Add to find the answer.
Change the answer to the largest size part.

5. You should always use the lowest common denominator. Look at Exercise 4 and tell why it would be better to use 8 for a common denominator than to use 16.

6. Find the difference between $\frac{1}{8}$ and $\frac{1}{4}$.

Bill Makes His Musket

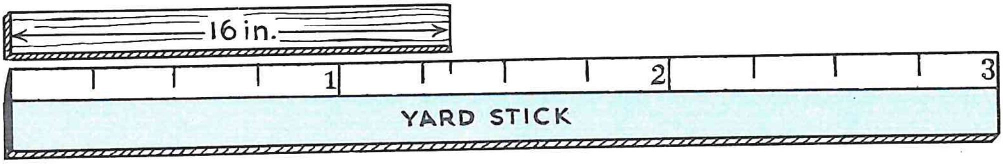
Bill carved the breech very carefully. Then he was ready to fasten the breech onto the barrel. He used an old broom handle for the barrel.

Bill knows that many of the old muskets were 6 ft. long. His musket without the stock is 5 feet long. He needs 1 ft. for the stock.

Bill found a piece of pine wood 8 in. long. How much too short is it? (Check it with fractions.) He bought a sack full of small pieces of wood.

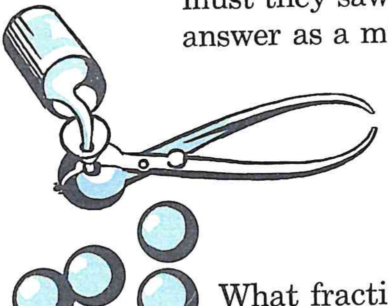
1. The first piece Bill measured was 4 in. long. How much too short was it for the stock of his musket? (Check it with fractions.)

2. Bill measured another piece that was 16 in. long.



How long was this piece in whole feet and a fraction?

3. Joe came over to Bill's house with a board that was 6 ft. long and 9 in. wide. The boys decided that they could cut a whole musket from this piece of wood. If they have sawed 4 ft. 4 in. along the length, how much farther must they saw to get to the end of the board? Write your answer as a mixed number.



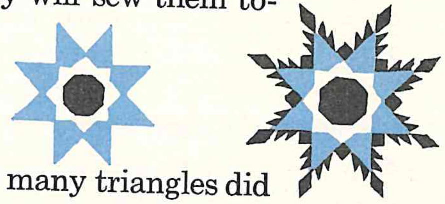
4. The boys decided to make bullets to carry in a leather pouch around their waists. Joe's uncle has a bullet mold, so the boys heated lead over the stove and poured it into the mold.

What fractional part of a dozen are the bullets shown? Bill made 3 bullets. What fractional part of a dozen does he have?

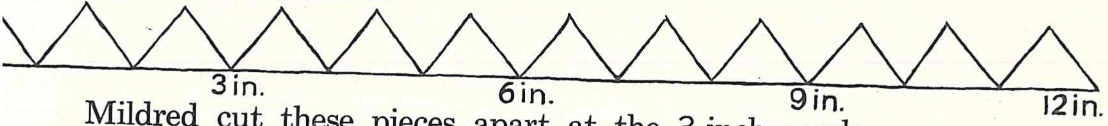
The Girls Begin a Quilt

The girls had such fun weaving a cover that they decided to make a quilt. These are the patterns the girls found. Which one do you think is the prettiest?

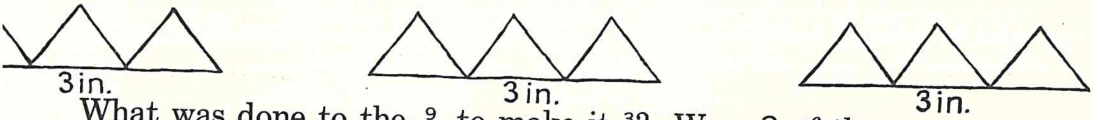
The girls decided to use the snowflake pattern. Each girl is to make one block, and then they will sew them together to make a quilt.



Mildred used a strip of light blue cloth to make several pieces at once. She folded the piece of cloth and cut along the edge of the pattern. How many triangles did she get from the whole?



Mildred cut these pieces apart at the 3-inch marks. Three of these pieces are $\frac{9}{12}$ of the whole. They are also $\frac{3}{4}$ of the whole.

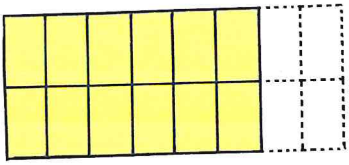


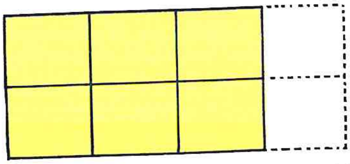
What was done to the $\frac{9}{12}$ to make it $\frac{3}{4}$? Were 3 of the twelfths put together? Then $3\overline{)12} = 4$ was the number of new parts in the whole. She also used the 9 one-inch pieces in groups of 3, and so she had $3\overline{)9} = 3$ of them.

Does this show what she really did?

$$\frac{3\overline{)9}}{3\overline{)12}} = \frac{3}{4}$$

Do you see that you can change a fraction to its **lowest terms** by dividing the numerator and denominator by the same number?





Mildred Works on Her Quilt Block

Mildred has already folded a piece of yellow cloth so that it can be cut into 16 small pieces. But she finds that she needs larger pieces. If she were to cut the cloth, using 2 of these small parts to make 1 piece, she would get the 6 pieces she needs. What part of the whole is one of the pieces?

Tell how $\frac{12}{16}$ of the whole is changed to $\frac{6}{8}$ of it. Does the following explain (in figures) what was done?

$$\frac{2\overline{)12}}{2\overline{)16}} = \frac{6}{8}$$

$\frac{12}{16}$ is changed to larger parts by dividing both the numerator and denominator by the same number. (This is called changing $\frac{12}{16}$ to *lower terms*).

By what number would you divide both the 6 and 8 in $\frac{6}{8}$ to change it to lower terms? $\frac{6}{8} = \frac{3}{4}$. Why?

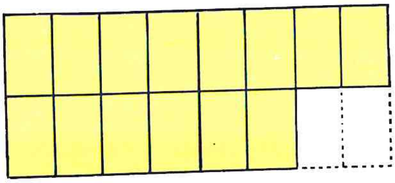
See if there is a larger number by which you can divide both the numerator and denominator of $\frac{12}{16}$ to give the same answer.

$$\frac{4\overline{)12}}{4\overline{)16}} = \frac{3}{4}$$

If you divide both the numerator and denominator by 4, you have $\frac{3}{4}$. Are these the *lowest terms* into which $\frac{12}{16}$ can be changed?

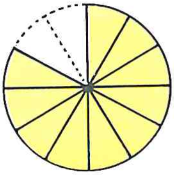
1. Change these fractions to their lowest terms.

a.



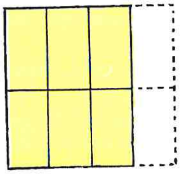
$\frac{14}{16} = \frac{?}{8}$

b.



$\frac{10}{12} = \frac{?}{6}$

c.



$\frac{6}{8} = \frac{?}{4}$

Change these fractions to their lowest terms:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**	**h.**	**i.**
2.	$\frac{6}{8}$	$\frac{5}{10}$	$\frac{7}{14}$	$\frac{12}{15}$	$\frac{4}{8}$	$\frac{8}{12}$	$\frac{6}{10}$	$\frac{3}{9}$	$\frac{4}{12}$
3.	$\frac{6}{9}$	$\frac{7}{21}$	$\frac{5}{15}$	$\frac{3}{12}$	$\frac{4}{6}$	$\frac{3}{6}$	$\frac{9}{12}$	$\frac{10}{12}$	$\frac{6}{12}$

Practice Changing Parts to Larger Parts

Practice in Changing Fractions to Lowest Terms

1. Change these fractions to lowest terms:

a. $\frac{4}{8}$ $\frac{2}{4}$ $\frac{6}{8}$ **b.** $\frac{2}{6}$ $\frac{3}{6}$ $\frac{6}{9}$ **c.** $\frac{8}{14}$ $\frac{5}{15}$ $\frac{3}{15}$

d. $\frac{8}{12}$ $\frac{2}{12}$ $\frac{3}{9}$ **e.** $\frac{7}{14}$ $\frac{8}{10}$ $\frac{4}{6}$ **f.** $\frac{10}{14}$ $\frac{15}{20}$ $\frac{8}{16}$

2. These fractions have been changed to lower terms. Change them to their lowest terms:

a. $\frac{12}{24} = \frac{6}{12}$ **b.** $\frac{18}{30} = \frac{9}{15}$ **c.** $\frac{4}{8} = \frac{2}{4}$ **d.** $\frac{8}{12} = \frac{4}{6}$

Change the fractions in these mixed numbers to their lowest terms: $15\frac{2}{4} = 15\frac{1}{2}$

	a.	**b.**	**c.**	**d.**	**e.**
3.	$12\frac{2}{4}$	$14\frac{3}{6}$	$9\frac{3}{9}$	$5\frac{3}{12}$	$4\frac{8}{12}$
4.	$7\frac{10}{12}$	$4\frac{12}{16}$	$13\frac{4}{8}$	$8\frac{6}{8}$	$12\frac{2}{4}$

Add these fractions and mixed numbers, and change the answers to lowest terms:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
5.	$\frac{1}{6}$ $\frac{3}{6}$	$\frac{3}{8}$ $\frac{3}{8}$	$\frac{1}{4}$ $\frac{1}{4}$	$\frac{2}{8}$ $\frac{2}{8}$	$\frac{2}{6}$ $\frac{2}{6}$	$\frac{1}{12}$ $\frac{9}{12}$	$\frac{3}{12}$ $\frac{6}{12}$
6.	$\frac{1}{8}$ $\frac{1}{8}$	$\frac{1}{8}$ $\frac{5}{8}$	$\frac{4}{12}$ $\frac{4}{12}$	$3\frac{1}{6}$ $4\frac{1}{6}$	$8\frac{2}{5}$ $3\frac{4}{5}$	$6\frac{1}{6}$ $2\frac{3}{6}$	$7\frac{3}{10}$ $2\frac{3}{10}$

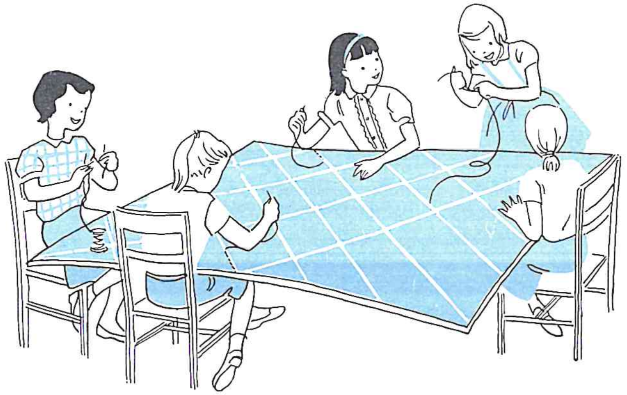
Subtract these fractions and mixed numbers, and change the answers to lowest terms:

7.	$\frac{3}{4}$ $\frac{1}{4}$	$\frac{7}{8}$ $\frac{1}{8}$	$\frac{10}{12}$ $\frac{2}{12}$	$\frac{7}{8}$ $\frac{5}{8}$	$\frac{3}{8}$ $\frac{1}{8}$	$\frac{4}{6}$ $\frac{2}{6}$	$\frac{5}{9}$ $\frac{2}{9}$
8.	$\frac{5}{6}$ $\frac{2}{6}$	$\frac{5}{12}$ $\frac{2}{12}$	$\frac{5}{10}$ $\frac{5}{10}$	$9\frac{3}{4}$ $1\frac{1}{4}$	$6\frac{3}{8}$ $2\frac{1}{8}$	$7\frac{5}{9}$ $2\frac{2}{9}$	$7\frac{16}{18}$ $5\frac{2}{18}$

9. Look at these fractions, and tell which ones have not been changed to their lowest terms. Do not use pencil.

a. $\frac{1}{2}$ $\frac{3}{4}$ $\frac{4}{6}$ **b.** $\frac{3}{9}$ $\frac{4}{5}$ $\frac{7}{14}$ **c.** $\frac{7}{12}$ $\frac{2}{3}$ $\frac{4}{8}$

d. $\frac{3}{7}$ $\frac{6}{9}$ $\frac{4}{10}$ **e.** $\frac{4}{6}$ $\frac{3}{4}$ $\frac{5}{8}$ **f.** $\frac{15}{20}$ $\frac{1}{4}$ $\frac{16}{20}$



Sewing Bee

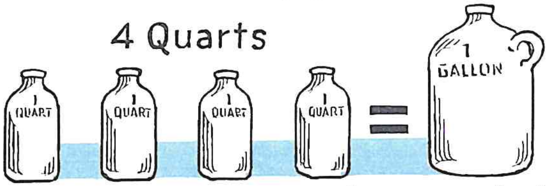
Eileen is planning a sewing bee. She was busy as a bee the night before the girls were to come to her home. She wanted to have the refreshments ready.

The first thing Eileen had to figure was how much punch she needed if each of the 14 girls was to have 2 glasses. Help Eileen find how much punch she needs.

1. Fill a glass and pour it into a pint jar. One glass is what fractional part of a pint?

2. Fill the pint jar with water. How many glasses are there in a pint? (1 glass = 8 ounces; 1 pint = 16 ounces.)

3. Pour the pint into a quart jar. A pint is what part of a quart? Fill the quart. How many pints are there in a quart? A glass is what fractional part of a quart? How many glasses are there in a quart?



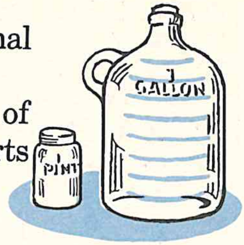
4. Pour the quart of water into a gallon jar. Fill the gallon jar. How many quarts = 1 gallon? What fractional part of the gallon jar is filled?

5. If there are 4 glasses in a quart and there are 4 quarts in a gallon, how many glasses are there in a gallon? What part of a gallon is 1 glass?

6. A pint is what part of a gallon? (Think how many pints there are in a gallon.)

7. How many quarts of punch will Eileen need if the 14 girls drink 2 glasses each?

8. One quart is $\frac{1}{4}$ of a gallon; 3 quarts is what fractional part of a gallon?



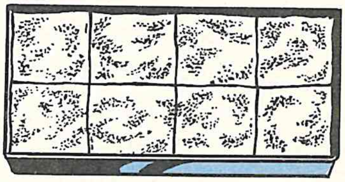
9. Eileen found 2 pint jars. She poured a quart of punch into them. Are there twice as many pints as quarts in a gallon? How many pints in a gallon?

1 quart = $\frac{1}{4}$ gal. 2 pints = $\frac{1}{4}$ gal.
Also, 2 pints = $\frac{2}{8}$ gal. Why?

Do you see that the changing of a part (qt.) into smaller parts half as large (pt.) gives you twice as many? Do these equal values tell you that this is true?

$\frac{1}{2} = \frac{2}{4}$ $\frac{1}{3} = \frac{2}{6}$ $\frac{1}{5} = \frac{2}{10}$

10. Eileen made gingerbread for the girls. She cut the gingerbread into 4 equal pieces, or $\frac{1}{4}$ parts. Then she cut each of the 4 equal parts into 2 equal parts. Does $\frac{1}{4} = \frac{2}{8}$ tell you that she had twice as many in the number of parts in the whole and in the number of parts in use?

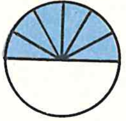


11. How many times as many parts do you get when you cut a part like $\frac{1}{2}$ into 3 equal parts? $\frac{1}{2} = \frac{?}{6}$

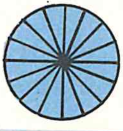
12. Can you think what you could do to a fraction like $\frac{1}{2}$ to find smaller parts of $\frac{1}{8}$? You know that there will be twice as many parts when you change one part into parts one-half as large, so changing a part to one that is $\frac{1}{4}$ as large gives how many times as many of the smaller parts?

Does multiplying both the numerator and the denominator of a fraction change the size of the part and the number of parts in the same way? Why?

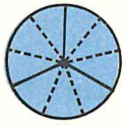
13. Study these pictures and tell how each is true:



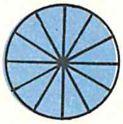
$\frac{1}{2} = \frac{3 \times 1}{3 \times 2} = \frac{3}{6}$



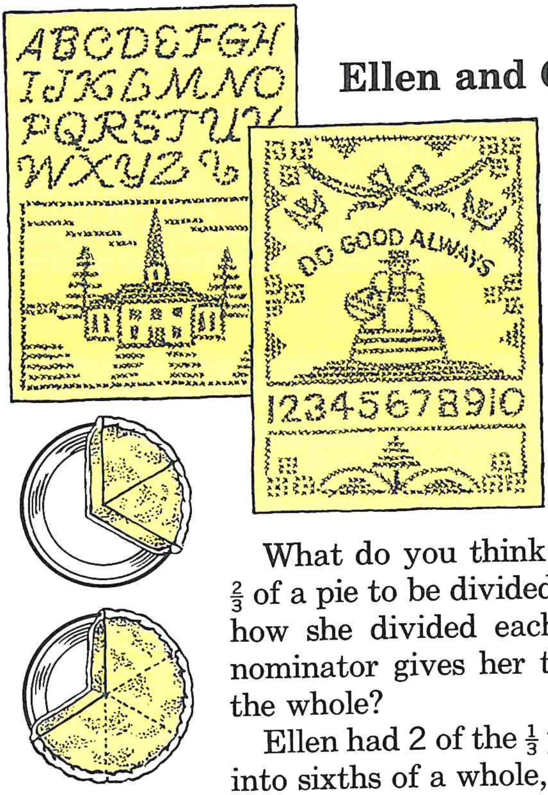
$\frac{1}{4} = \frac{4 \times 1}{4 \times 4} = \frac{4}{16}$



$\frac{1}{3} = \frac{?}{9}$



$\frac{1}{6} = \frac{?}{12}$



Ellen and Catherine Make Samplers

These are the samplers the girls are making. It takes a long time to make all the stitches. The girls decided to have a snack.

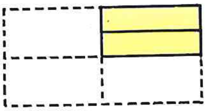
Ellen's mother said they could share the $\frac{1}{3}$ pie that was left. If Ellen cuts this into 2 equal parts, each equal part will be $\frac{1}{6}$ of the whole. Why? Why does this become $\frac{1}{3} = \frac{2 \times 1}{2 \times 3} = \frac{2}{6}$?

What do you think would have happened if Ellen had $\frac{2}{3}$ of a pie to be divided into parts of the $\frac{1}{6}$ size? You know how she divided each third and got sixths. What denominator gives her twice the number of equal parts in the whole?

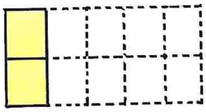
Ellen had 2 of the $\frac{1}{3}$ pieces, or $\frac{2}{3}$. When she divided them into sixths of a whole, she had twice as many equal parts. So the number of these parts in use was twice as many. Instead of 2 of the $\frac{1}{3}$ pieces, she then had 4 of the $\frac{1}{6}$ pieces ($\frac{2}{3} = \frac{4}{6}$). Explain this as $\frac{2}{3} = \frac{2 \times 2}{2 \times 3} = \frac{4}{6}$.

This is called changing a fraction to **higher terms**. (The numbers are larger.)

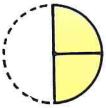
a.



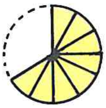
b.



c.



d.



1. $\frac{1}{4} = \frac{?}{8}$ $\frac{1}{5} = \frac{?}{10}$ $\frac{1}{2} = \frac{?}{4}$ $\frac{2}{3} = \frac{?}{12}$

Change these fractions to higher terms:

2. $\frac{1}{4} = \frac{?}{8}$ $\frac{3}{4} = \frac{?}{8}$ $\frac{3}{5} = \frac{?}{10}$ $\frac{3}{10} = \frac{?}{100}$

3. $\frac{1}{6} = \frac{?}{12}$ $\frac{5}{6} = \frac{?}{12}$ $\frac{2}{7} = \frac{?}{14}$ $\frac{4}{9} = \frac{?}{18}$

A Page of Practice

1. Change these fractions to give equal fractions in higher terms, and draw a picture to prove your answer.

$\frac{2}{3} = \frac{?}{18}$ $\frac{3}{4} = \frac{15}{?}$ $\frac{5}{6} = \frac{?}{30}$ $\frac{7}{8} = \frac{21}{?}$

2. Fill the blanks:

$\frac{1}{3} = \frac{5}{15}$

$\frac{2}{5} = \frac{6}{15}$

$\frac{2}{3} = \frac{8}{12}$

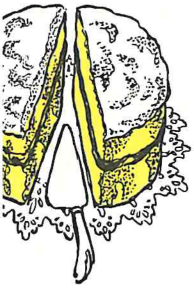
$\frac{1}{3}$ is divided into ? smaller parts to give fifteenths. You have ? times as many fifteenths as you had thirds.

$\frac{1}{5}$ is divided into ? smaller parts to give fifteenths. You have ? times as many equal parts into which the whole has been divided, and you have ? times the number of these equal parts which you are using, or ? fifteenths.

A whole has been divided into thirds and again into twelfths. You divided each third into ? parts. Instead of 2 of the $\frac{1}{3}$ equal parts, you now have ? times this many twelfths, or ? twelfths.

3. Change $\frac{1}{4}$ pound to sixteenths of a pound.

4. There is $\frac{2}{3}$ of a cake left. If nine friends came to visit you, how could you divide the cake so each of them could have a piece?

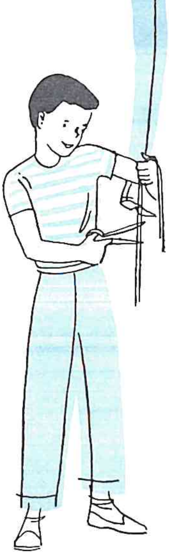


5. The fifth grade is giving a party. There is 1 large cake for refreshments. If there are 32 children at the party and Steven cuts the cake into halves, into how many pieces do you think each half should be divided so all of the 32 children will have an equal amount? $\frac{1}{2} = \frac{?}{?}$

6. Change these fractions to larger terms:

a.	b.	c.	d.	e.
$\frac{1}{2} = \frac{?}{8}$	$\frac{2}{3} = \frac{?}{9}$	$\frac{3}{5} = \frac{?}{10}$	$\frac{3}{4} = \frac{?}{12}$	$\frac{3}{4} = \frac{?}{8}$

Making Candles



The boys and girls are going to make candles today. They have been bringing parts of old candles to melt down for the wax. Also, Miss Star has brought boxes of paraffin that can be used.

Miss Star brought large kettles and melted the paraffin and old candles. She has boiling water to add to the wax when it begins to cool and harden.

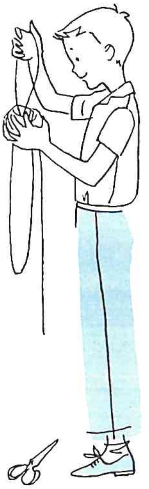
The children brought pieces of branches to which they will tie wicking. They will take turns dipping the wicks into kettles of paraffin.

1. Don is cutting a piece of wicking $\frac{3}{4}$ of a ft. long. He decided to cut another piece the same size. How much wicking has he used in all? Do the work using fractional parts.

$$\begin{array}{r} \frac{3}{4} \\ +\ \frac{3}{4} \\ \hline \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2} \end{array}$$

$\frac{6}{4}$ is more than a whole. $\frac{4}{4}$ is 1 whole; $\frac{6}{4}$ = 1 whole and $\frac{2}{4}$ or $1\frac{2}{4}$. $\frac{2}{4}$ can be changed to lowest terms: $1\frac{2}{4} = 1\frac{1}{2}$. Why?

Don used $1\frac{1}{2}$ ft. of wicking. Change $1\frac{1}{2}$ ft. to inches.



2. Don has cut 2 wicks each $\frac{11}{12}$ of a foot long. Find how much wicking he used for both pieces. Give the answer as a mixed number.

3. Don cut two wicks for Joyce. She wanted the wicks to be $\frac{9}{12}$ of a foot long. How much wicking must Don use for these wicks? Do the work using fractional parts.

4. Each box of paraffin weighed $\frac{5}{8}$ lb. What is the weight in pounds of two boxes?

5. Add and change to a mixed number:

$\frac{2}{3} + \frac{2}{3}$ $\frac{7}{8} + \frac{7}{8}$ $\frac{15}{20} + \frac{10}{20}$ $\frac{3}{12} + \frac{6}{12}$

Don Shares His Roll of Wicking

Don is sharing a roll of wicking with Bill, so he must cut off the amount he will need. He wants 4 pieces each $\frac{3}{4}$ yd. long. What is the total length that Don wants?

He could add to find the length of the 4 pieces: 4 of the pieces are equal to $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{3+3+3+3}{4} = \frac{12}{4} = 3$ yd. ($\frac{4}{4} = 1$ yd., so $\frac{12}{4} = 3$ yd. Explain.)

He could find what 4 of the $\frac{3}{4}$ yd. would be by multiplying: $4 \times \frac{3}{4} = \frac{4 \times 3}{4}$, because you multiply the number of parts, not the size of the part ($\frac{1}{4}$). So $4 \times \frac{3}{4} = \frac{4 \times 3}{4} = \frac{12}{4} =$ 3 yd. Don needs a piece of wicking 3 yd. long for the 4 pieces.

1. Bill is going to cut off 2 pieces smaller than the ones Don cut. These pieces are to be $\frac{2}{3}$ yd. long. Find how many yards he will need for both pieces.

2. Bill wanted to make 2 candles each 16 in. long. ($\frac{4}{9}$ yd. Why?) How much of Don's roll of wicking will he need? (Use inches to check your work with the fractions.)

3. The boys are making a box in which to keep the candles. They need 5 pieces of wood, each $\frac{2}{3}$ yd. long. Find the length of these 5 pieces in yards.

4. John brought a board that is 10 ft. long. Is it long enough for the 5 pieces? Will there be any of the board left?

5. Find these amounts:

a. $\frac{1}{2}$ ft. + $\frac{1}{2}$ ft. + $\frac{1}{2}$ ft. = ?

b. $3 \times \frac{1}{2}$ ft. $= \frac{?}{2} = ?$

c. $\frac{1}{4}$ mi. + $\frac{1}{4}$ mi. + $\frac{1}{4}$ mi. + $\frac{1}{4}$ mi. + $\frac{1}{4}$ mi. = ?

d. $5 \times \frac{1}{4}$ mi. = ?

Unit Review

1. Finding the fractional parts of a group:

a. 3 apples are what fractional part of a dozen?

b. 4 inches are what part of a foot?

c. 8 oranges are what part of a dozen?

d. 9 children are what part of 18 children?

2. Change to lowest terms:

a. $\frac{4}{8} = \frac{?}{4} = \frac{?}{2}$ **b.** $\frac{3}{6} = \frac{?}{2}$ **c.** $\frac{8}{12} = \frac{?}{6} = \frac{?}{3}$

d. $\frac{10}{12} = \frac{?}{6}$ **e.** $\frac{6}{8} = \frac{?}{4}$ **f.** $\frac{6}{10} = \frac{?}{5}$

3. Which of these are like fractions (have like parts)?

a. $\frac{3}{4}$ and $\frac{1}{4}$ **b.** $\frac{2}{3}$ and $\frac{1}{9}$ **c.** $\frac{4}{5}$ and $\frac{1}{7}$

d. $\frac{1}{3}$ and $\frac{7}{8}$ **e.** $\frac{5}{6}$ and $\frac{4}{7}$ **f.** $\frac{4}{12}$ and $\frac{1}{12}$

4. Change these fractions to like fractions:

a. $\frac{1}{4}, \frac{1}{2}$ **b.** $\frac{3}{4}, \frac{1}{8}$ **c.** $\frac{1}{5}, \frac{4}{10}$

d. $\frac{1}{3}, \frac{3}{9}$ **e.** $\frac{2}{7}, \frac{1}{14}$ **f.** $\frac{1}{8}, \frac{2}{16}$

5. Find the L.C.D. for these fractions, and add:

a.	**b.**	**c.**	**d.**	**e.**
$\frac{1}{4}$	$\frac{2}{3}$	$\frac{1}{6}$	$\frac{1}{8}$	$\frac{3}{4}$
$\underline{\frac{1}{8}}$	$\underline{\frac{1}{9}}$	$\underline{\frac{1}{3}}$	$\underline{\frac{1}{2}}$	$\underline{\frac{1}{12}}$

6. Subtract:

$\frac{1}{2}$	$\frac{1}{3}$	$\frac{4}{5}$	$\frac{5}{6}$	$\frac{3}{8}$
$\underline{\frac{1}{6}}$	$\underline{\frac{1}{12}}$	$\underline{\frac{2}{5}}$	$\underline{\frac{3}{12}}$	$\underline{\frac{3}{16}}$

7. Change to higher terms:

$\frac{1}{2} = \frac{?}{4}$ $\frac{1}{6} = \frac{?}{12}$ $\frac{1}{3} = \frac{?}{6}$ $\frac{2}{3} = \frac{?}{6}$ $\frac{1}{5} = \frac{?}{10}$

8. Multiply:

$2 \times \frac{3}{4}$ $3 \times \frac{5}{10}$ $2 \times \frac{7}{8}$ $3 \times \frac{5}{6}$ $7 \times \frac{7}{12}$

$3 \times \frac{1}{4}$ $5 \times \frac{2}{9}$ $6 \times \frac{1}{8}$ $4 \times \frac{2}{7}$ $5 \times \frac{3}{8}$

Unit Test

1. Can you cut 3 pieces of wood $\frac{3}{4}$ yd. long from a piece of wood 3 yd. long? How much more or less will you have?

2. How long must a piece of ribbon be in order to cut 5 pieces each $\frac{1}{4}$ yd. long from it?

3. How many candy bars will you need so each of 6 persons can have $\frac{1}{2}$ of a candy bar?

4. If you have 2 pieces of cloth $\frac{2}{3}$ yd. long, how much do you have altogether?

5. Make these drawings:

a. Draw a circle and divide it into thirds. Two of the one-thirds (or $\frac{2}{3}$) = $\frac{?}{12}$.

b. Draw a square and divide it into fourths. $\frac{3}{4} = \frac{?}{8}$.

c. Draw a rectangle and divide it into eighths. There are ? eighths in a whole. There are ? sixteenths in $\frac{7}{8}$.

6. Add these fractions after you have changed them to like fractions (change the answers to lowest terms if possible):

$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{2}{3}$
$\frac{3}{12}$	$\frac{1}{6}$	$\frac{2}{9}$	$\frac{2}{10}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{1}{6}$

7. Subtract after changing to like fractions:

$\frac{2}{3}$	$\frac{1}{3}$	$\frac{4}{5}$	$\frac{1}{4}$	$\frac{9}{12}$	$\frac{7}{14}$	$\frac{3}{4}$
$\frac{1}{6}$	$\frac{1}{9}$	$\frac{1}{10}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{7}$	$\frac{1}{8}$

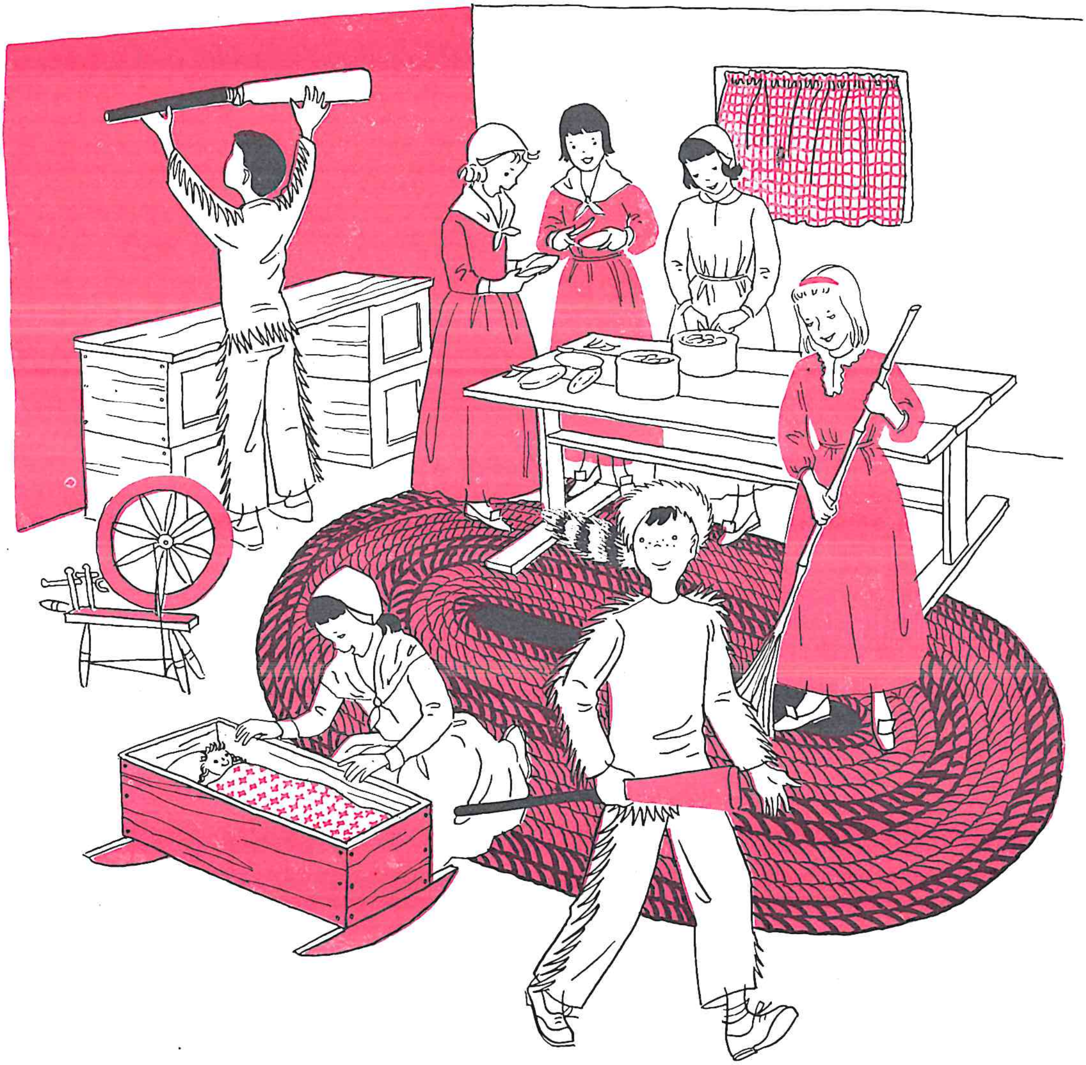
8. There are ? pints in a quart. A pint is what fractional part of a quart?

9. There are ? quarts in a gallon. A quart is what fractional part of a gallon?

10. There are ? pints in a gallon. A pint is what fractional part of a gallon?

UNIT 8

Living as the Pioneers Did



Bill thought it would be very nice if there was a fireplace so that he could put his musket over it, just the way the pioneers did. That started things rolling, and quick as a wink, the fifth graders decided to make pioneer furniture. They decided to use one end of their schoolroom as a real pioneer room in which to put all the things they made, and then they could pretend they were pioneers.

They made a bed, a table and benches, stools, a fireplace, a cradle, a braided rug for the floor, and even a spinning wheel which looks like a real one but doesn't work very well.

At last everything was finished, and then Nancy decided she wanted a dress like the ones the pioneer girls wore. She made it all by herself. She used a simple pattern that her mother cut out for her from a piece of wrapping paper. (You can make one like it if you wish.) Of course, as soon as the other girls heard about it, every girl in the class wanted to make one.

The boys were not going to be left behind, so each made a pair of trousers and a jerkin for himself. Some of the boys even brought coonskin caps to school. When everyone was all dressed up, they got together for an old-fashioned taffy pull.

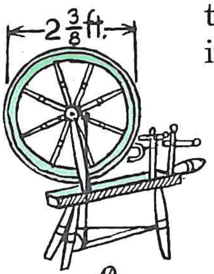
If you were making a piece of furniture and needed 5 pieces of wood, each 1 ft. 4 in. long, would you know how long a board you must find so you could cut 5 pieces this long from it? Would you multiply 5×1 ft. 4 in. or $5 \times 1\frac{1}{3}$ ft.?

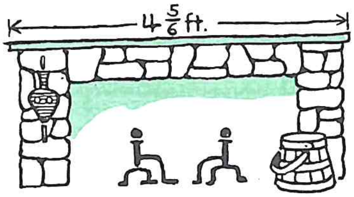
One of the girls is making johnnycake for everyone in her class. Would you know how to multiply $\frac{3}{4}$ cup of corn meal by 5 so there would be enough johnnycake for everyone?

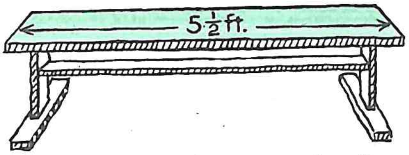
Tom's Sketch of the Pioneer Furniture

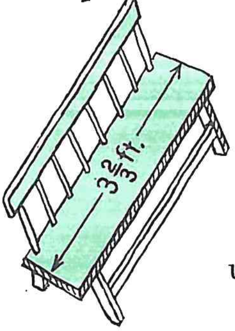
Use a yardstick to draw a line $1\frac{1}{2}$ yd. long. Do you see that you have a whole yard and a fraction of a yard? This is a *mixed number.*

You have already learned that the fractional part of the whole is always placed on the right of ones place ($1\frac{1}{2}$) in a mixed number.









Look at these sketches of pioneer furniture. Tom is working on the measurements of the furniture. Can you read the measurements?

1. The length of the table is $5\frac{1}{2}$ ft. Do you see any other drawing that shows this measurement?

2. Which is longer, the fireplace or the table?

3. Which piece of furniture is the closest to the measurements of the spinning wheel?

4. Read these numbers:

$2\frac{1}{2}$ $3\frac{1}{4}$ $6\frac{3}{8}$ $5\frac{3}{7}$ $4\frac{2}{9}$ $7\frac{4}{5}$ $8\frac{7}{12}$

5. Can you write these as mixed numbers?

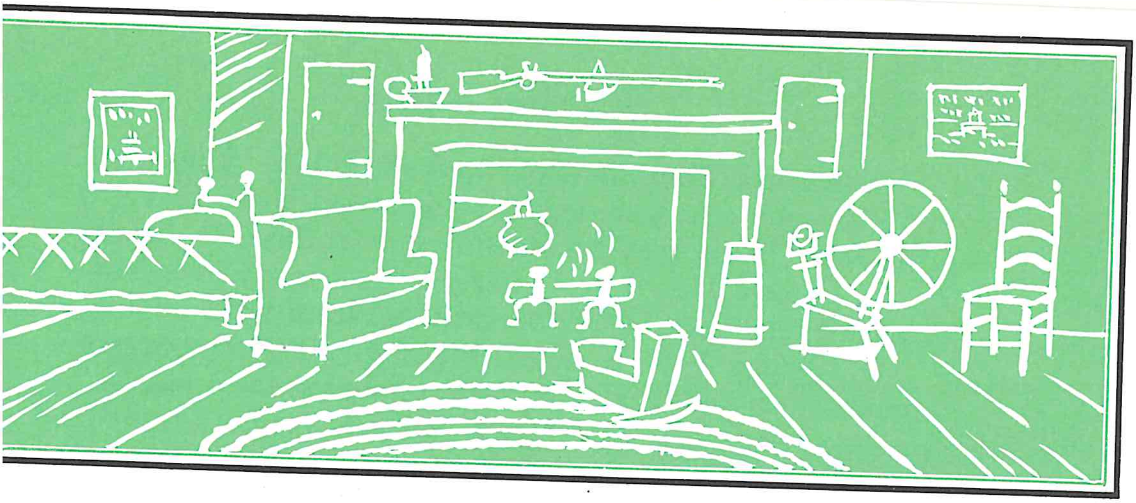
a. Six and one-third inches **b.** One and three-fifths
c. Ten and two-fifths feet **d.** Nine and six-sevenths

6. Draw pictures to show what the following mixed numbers mean:

a. $3\frac{1}{2}$ cups **b.** $2\frac{3}{4}$ inches **c.** $1\frac{1}{4}$ cups
d. $1\frac{1}{8}$ pies **e.** $1\frac{1}{3}$ apples **f.** $3\frac{2}{3}$ yards

7. Find the answers to these questions:

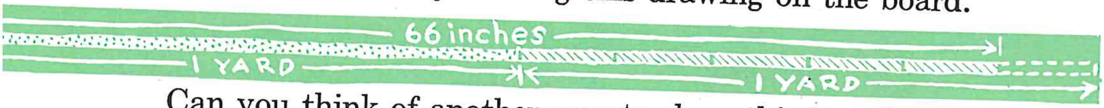
a. How many inches in $3\frac{1}{4}$ yd.?
b. How many things in $1\frac{1}{2}$ doz.?



The Pioneer Room

Bill made a rough sketch of a pioneer room on the blackboard during one of the class meetings. It showed just where the children thought each piece of furniture should be placed and the size of each piece. Then Bill made the drawing shown above for everyone to follow.

1. Ann read the measurement of the length of the bed as 66 inches. Bill said this could be read as a mixed number. He proved it by making this drawing on the board.



Can you think of another way to show this length as a mixed number?

Give two different ways of writing 66 in. as a mixed number.

2. What part of a foot is 8 inches? Make a drawing to prove it.

3. If a table was to be 80 inches long, find its length in whole yards and a fraction of a yard (mixed number).

4. Write these measurements in feet and inches:

57 in. = 4 ft. 9 in.

40 in. 16 in. 28 in. 32 in.

5. Write the measurements in Ex. 4 as mixed numbers.

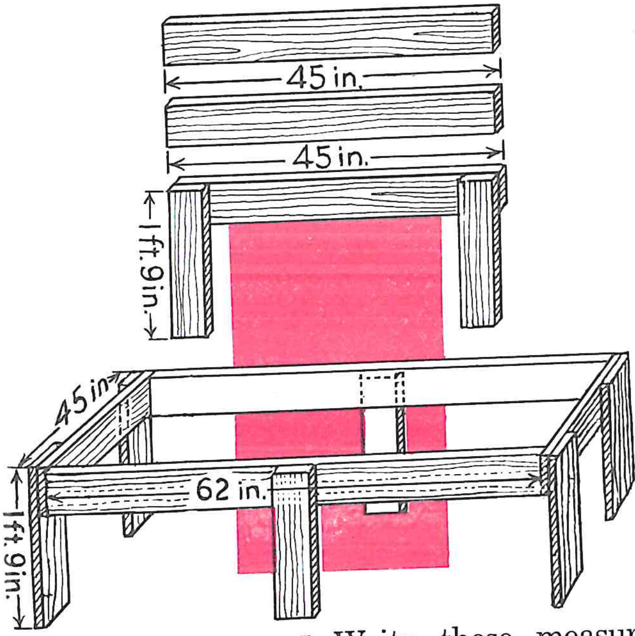
Changing Measured Values to Mixed Numbers

Making a Bed

1. Jeff and Tom are going to make a bed. They need 4 legs, each 1 ft. 9 in. long. They have a board that is 5 ft. long. Could they get the 4 legs from this 5 ft. board?

a. Change 1 ft. 9 in. to inches. How many inches are needed for 4 legs? Can you get them from 5 ft.?

b. Change 1 ft. 9 in. to a mixed number. Add or multiply to find how many feet are needed for 4 pieces.



2. Jeff and Tom are using 2 pieces like this to which they will nail the legs. Write the length of each board as a mixed number: $3\frac{?}{?}$ ft.

3. The boys decided to use two more legs for the middle of the bed. Tom measured each leg as 1 ft. + $\frac{3}{4}$ ft. Write this measurement as a mixed number without the + sign.

4. Jeff measured a board to see if it was long enough to make the length of the bed. The board was 62 inches long. Write this measurement as a mixed number in feet.

5. Write these measurements as mixed numbers in feet:

a. 10 ft. 8 in. **b.** 2 ft. 9 in.
c. 1 ft. 6 in. **d.** 3 ft. 2 in.

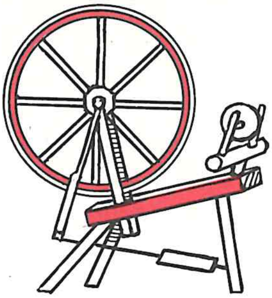
6. Write these measurements as mixed numbers in yards:

a. 3 ft. 18 in. **b.** 4 ft. 12 in.
c. 6 ft. 24 in. **d.** 3 ft. 9 in.

7. Change these mixed numbers to feet and inches:

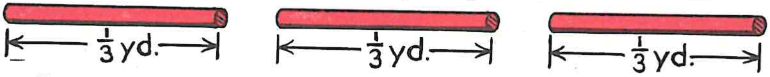
a. $27\frac{1}{2}$ in. **b.** $15\frac{1}{2}$ in. **c.** $28\frac{1}{4}$ in. **d.** $21\frac{1}{3}$ in.

Making a Spinning Wheel

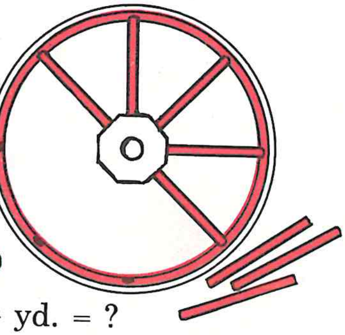


John and Toby are going to make a spinning wheel for their class.

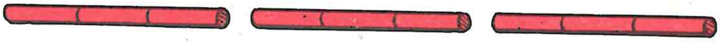
John found some pieces of round wood. Each piece was 1 yd. long. John cut each piece into three equal parts.



Look at the picture above, and tell how many pieces John has for the wheel.



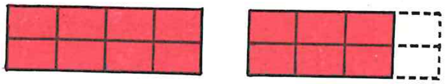
John cut more pieces until he had 8 pieces in his wheel. Each piece is $\frac{1}{3}$ yd. long. John has used 8 of the $\frac{1}{3}$ yd. pieces. How many whole yards of wood has John used?



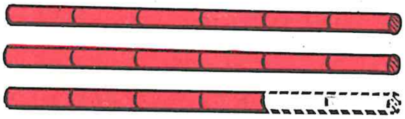
3 of $\frac{1}{3}$ yd. = $\frac{3}{3}$ yd. = 1 yd. So 8 of the $\frac{1}{3}$ yd. = $\frac{8}{3}$ yd. = ? yd., as a mixed number. (You want to find how many groups of 3 there are in 8.)

Do you see that every mixed number is equal in value to some improper fraction, or every improper fraction is equal in value to some mixed number?

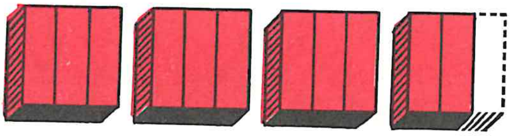
1. Find the whole and parts of wholes in these amounts:



These parts = ? wholes and ? parts of a whole, or ? .



These parts = ? wholes and ? parts of a whole, or ? .



These parts = ? wholes and ? parts of a whole, or ? .

Jane Makes Johnnycake

Jane is going to surprise her class tomorrow. She knows they work on the pioneer things the last hours of school. They get so hungry! Jane is going to make a piece of johnnycake for everyone tomorrow.

1 cup flour
1 teaspoon salt
3 teaspoons baking powder
2 tablespoons sugar
3/4 cup yellow corn meal
2 well beaten eggs
1 cup milk
1/4 cup melted shortening

Jane found the recipe at the left. She needs 4 times this amount to make enough for her class.

She can either add each amount 4 times, or she can multiply.

1. Jane needs $4 \times \frac{3}{4}$ cups of corn meal, or ? cups of corn meal.

a. How many $\frac{1}{4}$'s in 1 whole cup?
b. How many $\frac{1}{4}$'s in 4 whole cups?
c. How many $\frac{1}{4}$'s in $4 \times \frac{3}{4}$ cups?

2. Jane needs $4 \times \frac{1}{4}$ cups melted shortening. How many whole cups does she need?

3. Find how much flour Jane needs.

4. Write the recipe giving the amounts Jane must use.

5. Change these wholes to improper fractions:

a. $3 = \frac{?}{4}$ **b.** $2 = \frac{?}{8}$ **c.** $6 = \frac{?}{3}$

6. Change these mixed numbers to improper fractions:

a. $3\frac{2}{5} = \frac{?}{5} + \frac{2}{5} = ?$ **b.** $4\frac{5}{6} = \frac{?}{6} + \frac{5}{6} = ?$

c. $3\frac{7}{8} = \frac{?}{8} + \frac{7}{8} = ?$ **d.** $3\frac{1}{2} = \frac{?}{2} + \frac{1}{2} = ?$

e. $5\frac{2}{3} = \frac{?}{3} + \frac{2}{3} = ?$ **f.** $5\frac{1}{4} = \frac{?}{4} + \frac{1}{4} = ?$

g. $1\frac{3}{7} = \frac{?}{7} + \frac{3}{7} = ?$ **h.** $2\frac{3}{5} = \frac{?}{5} + \frac{3}{5} = ?$

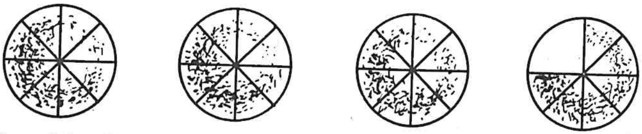
i. $10\frac{2}{3} = \frac{?}{3} + \frac{2}{3} = ?$ **j.** $4\frac{1}{2} = \frac{?}{2} + \frac{1}{2} = ?$

Everyone Eats Johnnycake

Everyone sat in a circle on the floor to eat the johnnycake Jane brought.

Count the pieces in these pans.

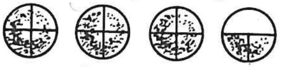
$\frac{30}{8}$ = ? wholes and ? parts of another whole, or ? as a mixed number.



Are there enough pieces for 28 children?

Count the pieces in these pans of johnnycake.

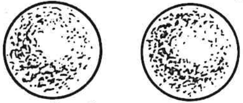
$\frac{14}{4}$ = ? wholes and $\frac{?}{4}$, or ? .



Divide these pans of johnnycake into 8 equal parts.

1 whole = $\frac{?}{8}$

2 wholes = $\frac{?}{8}$

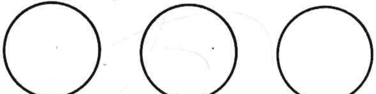


Divide these wholes into 3 equal parts.

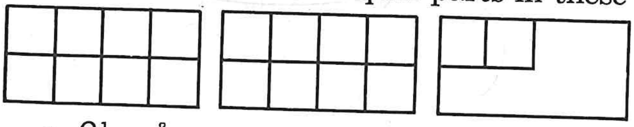
Each part is called ? .

1 whole = $\frac{?}{3}$

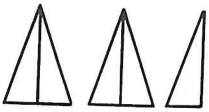
3 wholes = $\frac{?}{3}$



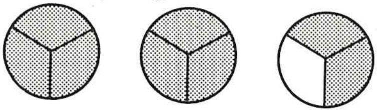
Find the number of equal parts in these pictures:



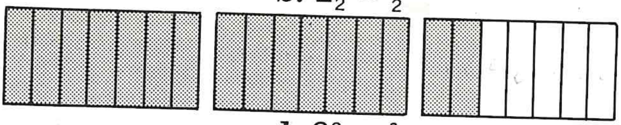
a. $2\frac{1}{4} = \frac{?}{8}$



b. $2\frac{1}{2} = \frac{?}{2}$



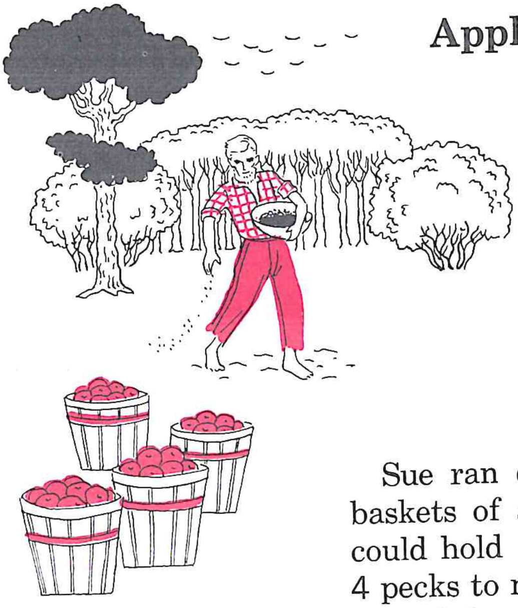
c. $2\frac{2}{3} = \frac{?}{3}$



d. $2\frac{2}{7} = \frac{?}{7}$

John and Toby bought a can of paint to paint the spinning wheel. The paint cost \$1.25. John and Toby had 5 quarters. Did they have enough money to pay for the paint, or did they have too much money? $\$\frac{5}{4}$ = $\$1\frac{?}{4}$ or \$? .

Apples from Johnny Appleseed



Sue thought and thought about what she could take to the class for a treat. Then the thought of Johnny Appleseed popped into her head. She would take some of her grandfather's apples to school. She could tell the children again about Johnny Appleseed's taking apple seeds around the country and planting them.

Sue ran down to the basement. She saw 4 baskets of apples. She knew that each basket could hold 1 peck. Sue knew also that it takes 4 pecks to make a bushel, so 4 of the $\frac{1}{4}$ parts of a bushel, or $\frac{4}{4}$, makes a whole bushel. Why?

4 pk. = 1 bu.

Sue picked apples at her grandfather's place last summer. She remembers that she had helped her grandfather one morning. They picked until they had filled 11 peck baskets. She wonders now how many bushels they had picked that day. She knows she can find out by using subtraction.

$\frac{11}{4} - \frac{4}{4} = \frac{7}{4}$

$\frac{7}{4} - \frac{4}{4} = \frac{3}{4}$

When you subtract $\frac{4}{4}$ (1 bu.) from $\frac{11}{4}$, you have $\frac{7}{4}$ left. Your answer is $1\frac{7}{4}$ bu. You know that $\frac{7}{4}$ is still an improper fraction. You can subtract another whole ($\frac{4}{4}$).

There is another bushel (2 bu. in all) with $\frac{3}{4}$ bu. left. So there are $2\frac{3}{4}$ bu. in 11 pk.

Sue knows she could divide to find how many bushels in 11 pk. Division is a short way of doing subtraction. (4 pk.)11 pk. Why?)

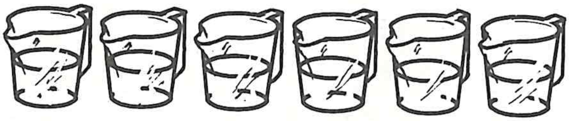
$$\begin{array}{r} 2\frac{3}{4}\text{ bushels} \\ 4\overline{)11}\phantom{\text{ bushels}} \\ 8\phantom{\text{ bushels}} \\ \hline 3\text{ R}\phantom{\text{ushels}} \end{array}$$

There are 2 bushels with 3 pk. remaining. 3 pk. out of 4 pk. = $\frac{3}{4}$ of a bushel. Why? Write the answer as $2\frac{3}{4}$ bu.

Practice in Changing Improper Fractions to Mixed Numbers

1. You know it takes $\frac{4}{4}$ to make 1 whole. It takes $\frac{8}{4}$ to make 2 wholes. $\frac{12}{4} = ?$ wholes.

2. $\frac{6}{2}$ cups are equal to ? full cups?



3. Change these to mixed numbers:

a. $\frac{3}{2}$ $\frac{5}{4}$ $\frac{7}{6}$ $\frac{11}{3}$ $\frac{9}{5}$ $\frac{7}{3}$

b. $\frac{9}{8}$ $\frac{12}{10}$ $\frac{9}{7}$ $\frac{15}{14}$ $\frac{9}{2}$ $\frac{10}{8}$

4. Can you put $\frac{3}{2}$ cups of flour into 1 cup? How would you write the amount of flour you have in $\frac{3}{2}$ cups as a mixed number?

5. What would be the easiest way to measure $\frac{5}{4}$ tablespoons of butter?

6. Write $\frac{5}{2}$ as a mixed number.

7. Which is the largest amount of fruit juice, $\frac{5}{4}$, $\frac{5}{3}$, or $1\frac{1}{2}$ glasses? (Change to mixed numbers to compare these amounts.)

8. Write these amounts in this order: largest, next to the largest, and so on until you write the smallest amount last:

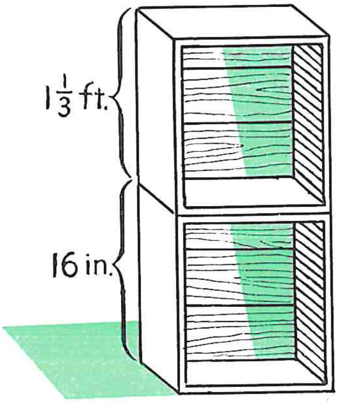
$\frac{8}{3}$ $\frac{9}{5}$ $\frac{7}{2}$ $\frac{11}{6}$

9. Would you rather have $\frac{7}{2}$ dollars or 13 quarters $\left(\$\frac{7}{2} \text{ or } \$\frac{13}{4}\right)$?

10. How many gallons are there in 15 quarts ($\frac{15}{4}$ gal.)?

11. Dan is making some three-legged stools for the pioneer room. He found he could cut 6 pieces of the right length for the legs from each old broom handle. Draw a picture to show Dan how many pieces he could get from 2 broom handles. 2 wholes $= \frac{?}{6}$

Pete and Steven Make a Fireplace


$1\frac{1}{3}$ ft.
16 in.

Pete and Steven are making a fireplace for the pioneer room. They are using apple boxes for each side of the fireplace. Each box is 16 in. tall. How tall will the fireplace be?

Steven added using inches. But Pete wanted to do it with mixed numbers, $1\frac{1}{3}$ ft. + $1\frac{1}{3}$ ft. He added the $\frac{1}{3}$'s first to see if he had enough for a whole:

$$\frac{1}{3} + \frac{1}{3} = \frac{1+1}{3} = \frac{2}{3}.$$

$$\begin{array}{r} 1\frac{1}{3} \\ +\ 1\frac{1}{3} \\ \hline 2\frac{2}{3} \end{array}$$

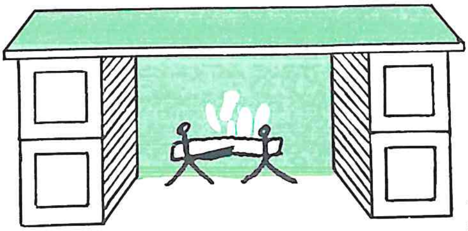
Then he added the wholes: 1 + 1 = 2.

The fireplace will be $2\frac{2}{3}$ ft. tall.

Is the length 32 in. the same as $2\frac{2}{3}$ ft.?

1. Add these mixed numbers:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
$2\frac{1}{3}$	$6\frac{2}{4}$	$2\frac{1}{8}$	$6\frac{1}{7}$	$4\frac{1}{5}$	$7\frac{2}{6}$	$5\frac{1}{12}$
$1\frac{1}{3}$	$1\frac{1}{4}$	$3\frac{2}{8}$	$6\frac{1}{7}$	$3\frac{2}{5}$	$5\frac{3}{6}$	$2\frac{6}{12}$



Pete brought 2 boards to put across the tops of the boxes.

One of the boards was $2\frac{1}{2}$ ft. long; the other board was $3\frac{1}{4}$ ft. long. He wanted to know if the 2 boards could be joined to give him a piece 6 ft. long.

$$\begin{array}{r} 2\frac{1}{2} \\ +\ 3\frac{1}{4} \\ \hline \end{array} = \begin{array}{r} 2\frac{2}{4} \\ 3\frac{1}{4} \\ \hline \end{array}$$

Pete knew he could not add $\frac{1}{2}$ and $\frac{1}{4}$ until he changed to halves or fourths.

He could not change $\frac{1}{4}$ to halves, because there is not enough in $\frac{1}{4}$ to make it a half, but he could change $\frac{1}{2}$ to $\frac{2}{4}$.

Are both boards together 6 ft. long?

2. Add the following mixed numbers (change to like fractions before you add):

$$\begin{array}{r} 2\frac{1}{6} \\ +\ 1\frac{1}{3} \\ \hline \end{array} = \begin{array}{r} 2\frac{1}{6} \\ +\ 1\frac{2}{6} \\ \hline \end{array} = 3\frac{1}{2}$$

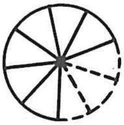
$3\frac{1}{4}$	$2\frac{2}{8}$	$3\frac{1}{2}$	$1\frac{1}{3}$	$1\frac{1}{8}$	$1\frac{1}{3}$	$6\frac{3}{9}$
$2\frac{3}{8}$	$1\frac{3}{16}$	$2\frac{5}{12}$	$1\frac{1}{6}$	$1\frac{3}{4}$	$1\frac{1}{9}$	$2\frac{1}{3}$

Practice in Adding Mixed Numbers

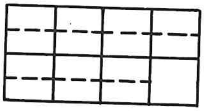
Add these mixed numbers:

	a.	b.	c.	d.	e.	f.
1.	$6\frac{2}{5}$ $3\frac{2}{5}$	$6\frac{1}{2}$ 2	$8\frac{1}{5}$ $8\frac{1}{5}$	$7\frac{1}{3}$ $1\frac{1}{3}$	$4\frac{1}{12}$ $2\frac{1}{12}$	$9\frac{1}{4}$ $6\frac{1}{2}$
2.	$4\frac{1}{2}$ $3\frac{1}{8}$	$3\frac{1}{3}$ $2\frac{1}{9}$	$4\frac{1}{8}$ $1\frac{1}{4}$	$5\frac{7}{10}$ $4\frac{1}{5}$	$2\frac{3}{6}$ $2\frac{1}{3}$	$5\frac{1}{2}$ $3\frac{3}{8}$

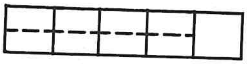
3. Change these fractional parts to lowest terms:



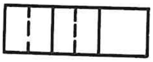
a. $\frac{6}{9} = \frac{?}{3}$



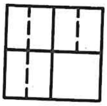
b. $\frac{14}{16} = \frac{?}{8}$



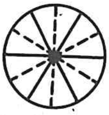
c. $\frac{8}{10} = \frac{?}{5}$



d. $\frac{4}{6} = \frac{?}{3}$



e. $\frac{6}{8} = \frac{?}{4}$



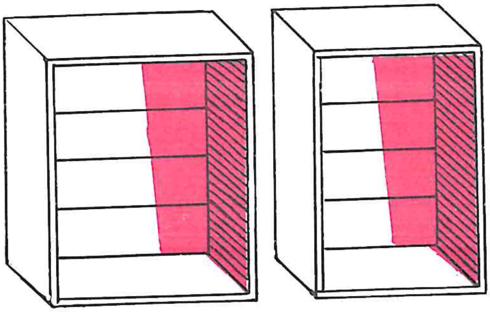
f. $\frac{6}{12} = \frac{?}{2}$

Add these fractions (change the answer to lowest terms):

	a.	b.	c.	d.	e.	f.
4.	$\frac{2}{8}$ $\frac{2}{8}$	$\frac{3}{6}$ $\frac{1}{6}$	$\frac{2}{9}$ $\frac{4}{9}$	$\frac{2}{12}$ $\frac{2}{12}$	$\frac{2}{6}$ $\frac{1}{6}$	$\frac{1}{4}$ $\frac{1}{4}$
5.	$\frac{5}{8}$ $\frac{1}{8}$	$\frac{3}{9}$ $\frac{3}{9}$	$\frac{1}{10}$ $\frac{4}{10}$	$\frac{1}{8}$ $\frac{3}{8}$	$\frac{5}{12}$ $\frac{1}{12}$	$\frac{1}{9}$ $\frac{3}{9}$

Add these mixed numbers (change answers to lowest terms):

6.	$2\frac{1}{6}$ $2\frac{1}{6}$	$8\frac{5}{16}$ $7\frac{3}{16}$	$2\frac{3}{8}$ $1\frac{3}{8}$	$6\frac{1}{4}$ $9\frac{1}{4}$	$2\frac{2}{6}$ $2\frac{2}{6}$	$9\frac{3}{8}$ $1\frac{1}{8}$
7.	$9\frac{2}{4}$ 1	$2\frac{5}{10}$ $5\frac{1}{10}$	$6\frac{1}{9}$ $3\frac{2}{9}$	$3\frac{1}{6}$ $4\frac{2}{6}$	$4\frac{3}{10}$ $4\frac{2}{10}$	$1\frac{3}{12}$ $1\frac{3}{12}$
8.	$3\frac{4}{16}$ $6\frac{8}{16}$	$3\frac{4}{8}$ $7\frac{2}{8}$	$5\frac{1}{8}$ $4\frac{1}{8}$	$7\frac{4}{6}$ 2	$1\frac{3}{9}$ $1\frac{3}{9}$	$3\frac{2}{12}$ $8\frac{6}{12}$



Busy as Bees

Everyone is working hard to finish the furniture. Jerry's job is to make a cupboard. He is going to use two boxes, if he can find the kind he wants. He wants the cupboard to be 2 ft. high, so it will fit with the size of the other things in the pioneer room.

Jerry found two boxes just the right height. One box was 1 ft. 9 in. wide. The other box was $1\frac{1}{2}$ ft. wide. He wants to know if both boxes nailed together will make a cupboard $3\frac{1}{2}$ ft. wide.

$$\begin{array}{r} 1\frac{3}{4} \\ +\ 1\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{rcl} 1\frac{3}{4} & = & 1\frac{3}{4} \\ +\ 1\frac{1}{2} & = & 1\frac{2}{4} \\ \hline \end{array}$$

$$\begin{array}{rcl} 1\frac{3}{4} & = & 1\frac{3}{4} \\ +\ 1\frac{1}{2} & = & 1\frac{2}{4} \\ \hline & & 2\frac{5}{4} = 3\frac{1}{4} \end{array}$$

Do you see what Jerry will have to do before he can add? Will he change the 9 in. to a fractional part of a foot, or will he change $\frac{1}{2}$ ft. to inches?

Use mixed numbers. Would you add the fractions or the whole numbers first?

If you add the fractions, will you have to change the answer to a whole number and a fraction? Does this tell you to add the fractions first? Tell why.

Could you do this by holding a value as you do when adding whole numbers? Explain.

Add these mixed numbers:

	a.	b.	c.	d.	e.
1.	$2\frac{2}{3}$ $1\frac{5}{9}$	$4\frac{1}{2}$ $2\frac{7}{8}$	$8\frac{3}{5}$ $2\frac{6}{10}$	$4\frac{7}{8}$ $4\frac{4}{16}$	$7\frac{2}{3}$ $\frac{6}{9}$
2.	$1\frac{5}{6}$ $1\frac{4}{12}$	$2\frac{6}{12}$ $3\frac{3}{4}$	$6\frac{3}{8}$ $2\frac{3}{4}$	$4\frac{1}{2}$ $3\frac{5}{8}$	$1\frac{7}{8}$ $1\frac{1}{4}$

3. Change these improper fractions to mixed numbers:

a. $\frac{7}{6}, \frac{5}{3}, \frac{6}{4}$ **b.** $\frac{9}{8}, \frac{11}{8}, \frac{7}{4}$ **c.** $\frac{6}{5}, \frac{12}{8}, \frac{9}{6}$

d. $\frac{6}{4}, \frac{10}{6}, \frac{21}{15}$ **e.** $\frac{8}{6}, \frac{15}{4}, \frac{9}{8}$ **f.** $\frac{7}{6}, \frac{12}{3}, \frac{8}{5}$

Ben Finds Another Way to Add Mixed Numbers

Ben likes to find different ways to do things. He is always experimenting. When he learns how to do something one way, he works until he finds another way to do it. This is the way Ben found to add mixed numbers.

Ben changes mixed numbers to improper fractions before adding:

$$\begin{array}{rcl} 2\frac{5}{8} & = & \frac{21}{8} \\ \underline{2\frac{7}{8}} & & \underline{\frac{23}{8}} \\ & & \frac{44}{8} = 5\frac{4}{8} = 5\frac{1}{2} \end{array}$$

Why does $2\frac{5}{8} = \frac{21}{8}$?
Why does $2\frac{7}{8} = \frac{23}{8}$?

Ben adds the numerators to find how many eighths he has: $\frac{44}{8} = 5\frac{4}{8} = 5\frac{1}{2}$. Why?

Change to improper fractions and add:

	a.	b.	c.	d.	e.	f.	g.
1.	$2\frac{3}{6}$ $4\frac{1}{6}$	$1\frac{7}{8}$ $2\frac{1}{8}$	$2\frac{2}{6}$ $1\frac{1}{6}$	$2\frac{2}{4}$ $1\frac{3}{4}$	$1\frac{5}{6}$ $1\frac{2}{6}$	$2\frac{5}{8}$ $1\frac{4}{8}$	$2\frac{7}{10}$ $1\frac{2}{10}$
2.	$2\frac{1}{4}$ $1\frac{1}{4}$	$2\frac{4}{10}$ $2\frac{7}{10}$	$1\frac{3}{9}$ $3\frac{1}{9}$	$2\frac{1}{2}$ $1\frac{1}{2}$	$3\frac{1}{6}$ $1\frac{2}{6}$	$1\frac{3}{7}$ $3\frac{6}{7}$	$4\frac{1}{2}$ $\frac{1}{2}$

$$\boxed{\begin{array}{r} 2\frac{1}{4} \\ \underline{+\ 1\frac{3}{12}} \end{array}}$$

Ben wants to do this exercise. He knows he must change the fractions to like fractions before he can add. He decides to change both fractions to twelfths. Would you use twelfths? Could you use fourths? Tell why.

$$\begin{array}{rcccl} 2\frac{1}{4} & & \frac{24}{12} + \frac{3}{12} & & \frac{27}{12} \\ \underline{+\ 1\frac{3}{12}} & = & \underline{\frac{12}{12} + \frac{3}{12}} & = & \underline{+\ \frac{15}{12}} \\ & & & & \frac{42}{12} = ? \end{array}$$

How were the $\frac{42}{12}$ found?

To change $\frac{42}{12}$ to a mixed number you do this:

$$\frac{12}{12} = 1, \text{ so } \frac{42}{12} = \begin{array}{r} 3\frac{6}{12} = ? \\ 12\overline{)42} \\ \underline{36} \\ 6 \end{array}$$

Add:

3.	$2\frac{1}{4}$ $1\frac{6}{12}$	$1\frac{2}{3}$ $1\frac{1}{6}$	$1\frac{1}{2}$ $\frac{3}{4}$	$3\frac{1}{8}$ $2\frac{1}{4}$	$2\frac{2}{3}$ $1\frac{1}{9}$	$2\frac{1}{5}$ $1\frac{3}{10}$	$2\frac{4}{9}$ $\frac{2}{3}$

Ben Finds Still Another Way

Look at the way Ben adds this exercise:

$$\begin{array}{r} 2\frac{3}{4} \\ +\,1\frac{1}{2} \\ \hline \end{array} = \begin{array}{r} 2\frac{3}{4} \\ +\,1\frac{2}{4} \\ \hline 1\frac{1}{4} \end{array}$$

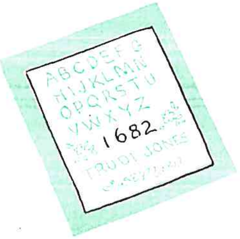
The first thing Ben does is to add the fractions: $\frac{3}{4} + \frac{2}{4} = \frac{5}{4}$, or $1\frac{1}{4}$. He writes this amount under the line.

$$\begin{array}{r} 2\frac{3}{4} \\ +\,1\frac{1}{2} \\ \hline \end{array} = \begin{array}{r} 2\frac{3}{4} \\ +\,1\frac{2}{4} \\ \hline 1\frac{1}{4} \\ 3 \\ \hline 4\frac{1}{4} \end{array}$$

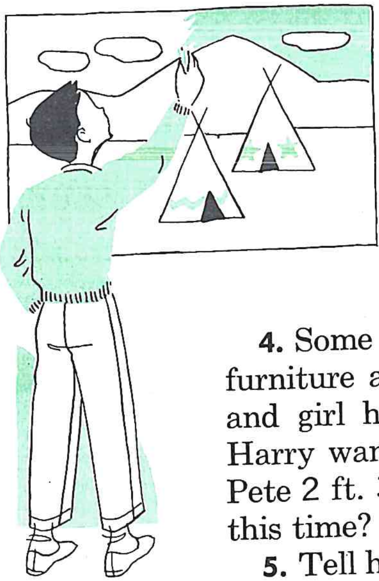
Ben adds the wholes: $2 + 1 = 3$. He writes this number (3) below the 1 in ones place. $3 + 1 = 4$ wholes. The answer is $4\frac{1}{4}$.

Use Ben's method when you add these:

	a.	**b.**	**c.**	**d.**	**e.**
1.	$1\frac{2}{3}$ $1\frac{5}{6}$	$2\frac{3}{4}$ $1\frac{5}{8}$	$1\frac{1}{2}$ $2\frac{3}{4}$	$2\frac{3}{6}$ $2\frac{7}{12}$	$3\frac{7}{9}$ $1\frac{5}{6}$



2. Ben is going to make a cardboard frame for the sampler which will hang on the wall. He needs 4 pieces 9 in. long. Add these 4 lengths as fractional parts of a yard to see if he can get them from a piece of cardboard 1 yd. long.



3. Miss Doe asked Ben if he would cut pieces of wrapping paper to paint a mural. John needs a space 3 ft. 3 in. long, Sally wants 4 ft. 9 in., Hal wants 2 ft. 3 in., and Peggy wants 2 ft. 6 in. What length of wrapping paper will Ben need for all the pieces? (Add as mixed numbers.)

4. Some of the children who have finished making their furniture are going to paint a pioneer mural. Each boy and girl has asked for space for a part of the picture. Harry wants 3 ft. 3 in., Mary 2 ft. 6 in., Joan $3\frac{1}{2}$ ft., and Pete 2 ft. 3 in. What total length of paper will Ben need this time? (Add mixed numbers.)

5. Tell how \$9.75 can be thought of as a mixed number.

Adding Mixed Numbers—Writing Partial Sums

Ben Takes a Look at All His Methods

Ben cannot decide which of the ways to add fractions he likes best. He has decided to write all of them down and take a good look at them:

a.
$$\begin{array}{r} 1\frac{3}{4} \\ +\ 1\frac{3}{4} \\ \hline 1\frac{1}{2} \\ 2 \\ \hline 3\frac{1}{2} \end{array}$$

b.
$$\begin{array}{l} 1\frac{3}{4} \\ +\ 1\frac{3}{4} \\ \hline 2\frac{6}{4} = 3\frac{2}{4} = 3\frac{1}{2} \end{array}$$

c.
$$\begin{array}{l} 1\frac{3}{4} = \frac{7}{4} \\ 1\frac{3}{4} = \frac{7}{4} \\ \hline \phantom{1\frac{3}{4} = }\frac{14}{4} = 3\frac{2}{4} = 3\frac{1}{2} \end{array}$$

When the fractions are added, the sum is $\frac{6}{4} = 1\frac{1}{2}$. Why?

When the wholes are added, the sum is 2 wholes. Add the 2 wholes to $1\frac{1}{2}$; the answer is $3\frac{1}{2}$.

Tell how Ben found the answer $3\frac{1}{2}$ for Example **b.**

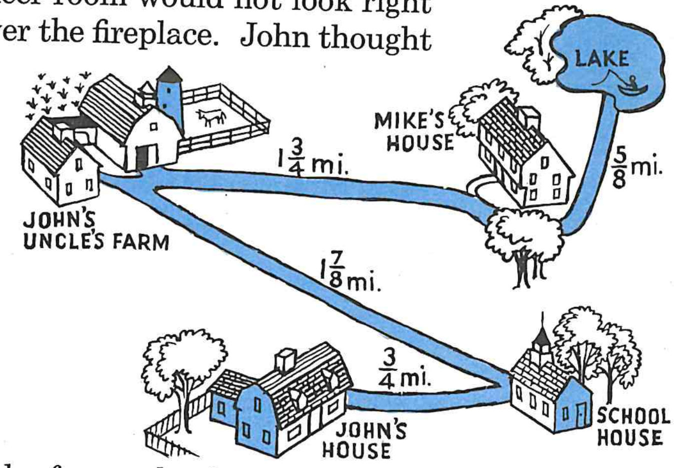
Ben changed the mixed numbers to improper fractions first.

How do you know that $\frac{14}{4} = 3\frac{2}{4} = 3\frac{1}{2}$?

1. Everyone said the pioneer room would not look right without some ears of corn over the fireplace. John thought he could get some at his uncle's farm.

Find how far John rode to get from his home to his uncle's farm and back.

2. John rode from school to his uncle's farm with Mike. Mike lives $1\frac{3}{4}$ miles farther on. How far is it from John's house to Mike's?

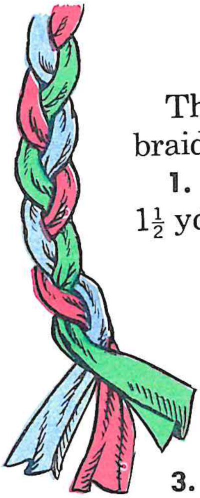


3. The boys rode to the lake from school to see if they could find any long feathers to put on the walls of the pioneer room. Find the distance they rode (round trip).

4. Add:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
$9\frac{1}{2}$	$4\frac{2}{6}$	$5\frac{3}{8}$	$7\frac{9}{10}$	$4\frac{2}{3}$	$6\frac{3}{4}$	$1\frac{4}{5}$
$6\frac{1}{2}$	$5\frac{5}{6}$	$2\frac{7}{8}$	$4\frac{3}{10}$	$6\frac{2}{3}$	$5\frac{3}{4}$	$3\frac{4}{5}$

The Girls Make a Braided Rug



The girls are cutting strips of woolen cloth to be braided into a rag rug for the floor of the pioneer room.

1. Thelma measured a strip from a wool coat. It is $1\frac{1}{2}$ yd. long. Margaret's strip is $1\frac{3}{4}$ yd. long. The girls want to know how long both strips are.

2. Susan is sewing the braided strips into a rug. Add these lengths to find how many yards of wool strips she has sewn together so far: $2\frac{1}{2}$ yd., $3\frac{1}{4}$ yd., $1\frac{3}{4}$ yd.

3. Betsy measured her braided strip and found it was $2\frac{1}{2}$ yd. long. Janet's strip is $1\frac{2}{3}$ ft. long. How many feet of braid does Susan have to sew in putting both strips together for the braided rug?

4. The rug was $\frac{1}{4}$ yd. wide at the end of the first hour that the girls worked. They added $1\frac{1}{2}$ ft. to the width before they stopped working. How wide was the rug when they stopped?

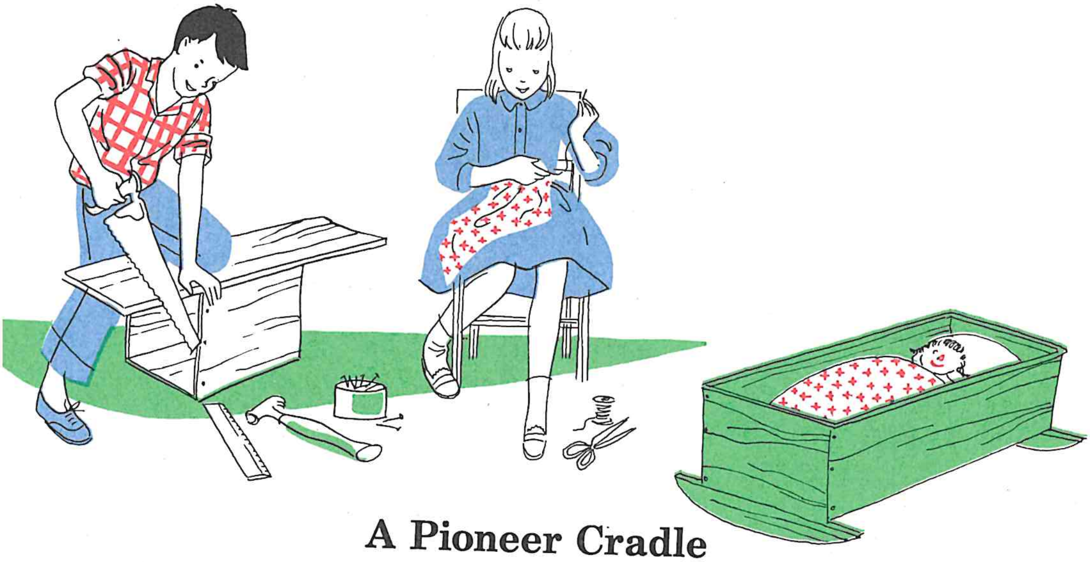
5. Betsy made some punch for the girls. She used $2\frac{1}{2}$ cups of apricot juice, $3\frac{1}{2}$ cups of orange juice, $1\frac{1}{4}$ cups of pineapple juice, and 3 cups of ginger ale. Find how many cups of punch Betsy made.

Add these mixed numbers:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**
6.	$1\frac{1}{2}$ $1\frac{1}{2}$	$2\frac{1}{3}$ $1\frac{2}{3}$	$5\frac{4}{5}$ $2\frac{3}{5}$	6 $2\frac{4}{7}$	$5\frac{3}{5}$ $1\frac{2}{5}$	$8\frac{3}{4}$ 2
7.	$9\frac{2}{3}$ $3\frac{2}{3}$	$9\frac{3}{5}$ $2\frac{4}{10}$	$2\frac{3}{4}$ $\frac{1}{2}$	$5\frac{1}{3}$ $2\frac{4}{6}$	$2\frac{5}{9}$ $1\frac{2}{18}$	$1\frac{1}{2}$ $4\frac{5}{8}$
8.	$3\frac{1}{5}$ $2\frac{3}{10}$	$1\frac{3}{8}$ $3\frac{3}{4}$	$5\frac{1}{2}$ $2\frac{2}{10}$	$1\frac{1}{8}$ $3\frac{1}{4}$	$3\frac{2}{5}$ $2\frac{1}{10}$	$3\frac{1}{6}$ $3\frac{2}{9}$

9. Add by changing to improper fractions:

a. $3\frac{1}{5} + 2\frac{3}{5}$ **b.** $4\frac{1}{3} + 2\frac{2}{3}$ **c.** $1\frac{1}{2} + 2\frac{3}{8}$



A Pioneer Cradle

The boys and girls know that every pioneer home had a cradle for the baby. It is Jimmy's job to make the cradle. Ann is going to make the bedclothes. She has a doll that they can use for a baby.

1. Jimmy found 3 pieces of board that he could use for the sides. One piece is $\frac{3}{4}$ yd. long, another piece is 2 ft. long, and the third piece is 3 ft. long. How many of these pieces are long enough to make the sides of the cradle if Jimmy wants it to be 2 ft. 3 in. long?

2. Jimmy made the ends of the cradle 15 in. wide. How many feet and what fraction of a foot is 15 in.?

3. The rockers raise the cradle $2\frac{1}{2}$ in. off the floor. The cradle body is 16 in. in height. How far is it from the top of the cradle to the floor?

4. Ann could not find a piece of cloth that was large enough for the cradle cover. She sewed two pieces together. One piece was $10\frac{5}{8}$ in. wide, and the other piece was $11\frac{3}{8}$ in. wide. How wide did Ann make the cover?

5. Add:

$\frac{7}{8}$	$6\frac{3}{4}$	$9\frac{3}{4}$	$9\frac{3}{8}$	$\frac{3}{12}$	$7\frac{11}{12}$	$4\frac{1}{3}$	$\frac{3}{8}$
$\frac{3}{8}$	$2\frac{1}{12}$	$\frac{1}{4}$	$2\frac{1}{2}$	$\frac{6}{12}$	$5\frac{5}{12}$	$2\frac{2}{9}$	$\frac{3}{8}$

Party Time

"Everything is done in our pioneer room," Jane said. "Now we can use it. Let's give a pioneer party!"

Everyone thought it was a fine idea. They decided to have doughnuts and milk to drink.

Three of the children said they could bring $\frac{1}{2}$ dozen doughnuts each. This will give them $1\frac{1}{2}$ dozen. Why? But they need $2\frac{3}{4}$ dozen so that each child who is coming can have one. How many children are coming to the party? Find how many more dozen they will need if they have $1\frac{1}{2}$ dozen.

There are two ways to do this subtraction:

a. mixed numbers:

$$\begin{array}{r} 2\frac{3}{4} \\ -\ 1\frac{1}{2} \\ \hline \end{array} = \begin{array}{r} 2\frac{3}{4} \\ -\ 1\frac{2}{4} \\ \hline 1\frac{1}{4} \end{array}\text{ dozen}$$

b. improper fractions:

$$\begin{array}{r} 2\frac{3}{4} \\ -\ 1\frac{1}{2} \\ \hline \end{array} = \begin{array}{r} \frac{11}{4} \\ -\ \frac{6}{4} \\ \hline \frac{5}{4} \end{array}\text{ doz.} = 1\frac{1}{4}\text{ doz.}$$

1. Henry's father said he would be glad to give enough fresh milk from his farm for all the boys and girls. Henry's mother is going to bring the milk in from the farm. It is $2\frac{7}{8}$ miles from the farm to the school. Mrs. Brown stopped at the gas station, which is $2\frac{1}{4}$ miles from the farm. How much farther does she have to drive to reach the school?

2. Henry and Steven ride to school together on their bikes. Steven lives $3\frac{1}{2}$ mi. from school. How much farther from school does Steven live than Henry?

3. How much farther is it round trip from the school to Steven's home than round trip to Henry's home?

4. Subtract:

a.
$$\begin{array}{r} 4\frac{2}{3} \\ -\ 2\frac{1}{3} \\ \hline \end{array}$$

b.
$$\begin{array}{r} 5\frac{1}{2} \\ -\ 3 \\ \hline \end{array}$$

c.
$$\begin{array}{r} 4\frac{3}{4} \\ -\ 3\frac{1}{2} \\ \hline \end{array}$$

d.
$$\begin{array}{r} 5\frac{1}{2} \\ -\ 3\frac{1}{4} \\ \hline \end{array}$$

e.
$$\begin{array}{r} 2\frac{7}{8} \\ -\ 1\frac{1}{8} \\ \hline \end{array}$$

f.
$$\begin{array}{r} 6\frac{3}{9} \\ -\ 4\frac{2}{9} \\ \hline \end{array}$$

Doing as the Pioneers Did

Did you ever do some of the things the pioneers did? These are some of the things the boys and girls did in their pioneer room.

1. Janet churned cream for $\frac{3}{4}$ of an hour before she got butter. How much longer did it take her to churn the cream into butter than to make the bed, which took her $\frac{1}{4}$ of an hour?

2. It took Bill $\frac{1}{4}$ of an hour to shell enough corn to make hominy. The corn had to soak $2\frac{1}{2}$ hours. Find the difference in the length of time it took to shell the corn and to soak it.

3. Marjorie brought $2\frac{1}{2}$ packages of paraffin to make more candles. The class needs 4 packages. How many more packages must the class get to give the children what they need?

4. Jim made a broom by peeling the end of a cane. The cane broom was $2\frac{1}{2}$ ft. long. Then he made a duster of feathers that was 18 in. long. How much longer was the broom than the duster? (Use a yardstick to check your answer.)

Subtract:

	a.	b.	c.	d.	e.	f.
5.	$2\frac{1}{2}$ $3\frac{3}{16}$	$3\frac{2}{5}$ $4\frac{1}{10}$	$2\frac{6}{8}$ $2\frac{4}{8}$	$3\frac{2}{9}$ $1\frac{4}{18}$	$6\frac{3}{4}$ 2	$7\frac{3}{4}$ $2\frac{3}{8}$
6.	$4\frac{5}{6}$ $4\frac{3}{6}$	$4\frac{7}{8}$ $\frac{1}{8}$	$3\frac{5}{8}$ $1\frac{3}{16}$	$5\frac{4}{5}$ $2\frac{7}{10}$	$6\frac{3}{4}$ $2\frac{6}{12}$	$9\frac{1}{5}$ 7

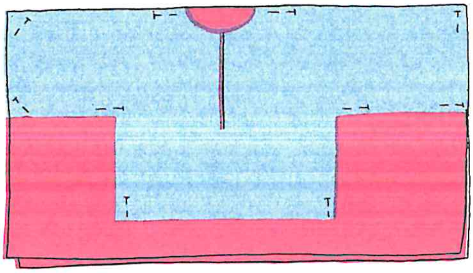
Add:

7.	$4\frac{2}{6}$ $2\frac{1}{3}$	$5\frac{1}{2}$ $2\frac{3}{4}$	$6\frac{3}{8}$ $1\frac{7}{16}$	$4\frac{5}{7}$ $2\frac{3}{7}$	$7\frac{1}{10}$ 6	$4\frac{3}{4}$ $1\frac{2}{8}$

Nancy Wants a Pioneer Dress

Nancy loves to dress up, so she has decided to make a dress like those of the pioneer girls. Nancy's mother told her she could have 2 pieces of gay red cloth from which to make her dress.

Nancy's mother cut a pattern from wrapping paper for her to use.



She is using the smaller piece of cloth for the blouse. The cloth is $1\frac{1}{4}$ yd. long when it is folded double. Nancy's blouse takes only $1\frac{3}{4}$ yd. How much cloth will Nancy have left after she makes the blouse?

$$\begin{array}{r} 2\frac{1}{2} \\ -\,1\frac{3}{4} \\ \hline \end{array} \qquad \begin{array}{r} 1\frac{3}{2} \\ -\,1\frac{3}{4} \\ \hline \end{array} \qquad \begin{array}{r} 1\frac{6}{4} \\ -\,1\frac{3}{4} \\ \hline \frac{3}{4} \end{array}$$

Nancy cannot take $\frac{3}{4}$ from $\frac{1}{2}$. She will use 1 of the 2 wholes to give her more halves. Why? How many halves are there in 1 whole?

$\frac{2}{2} = 1$ whole; $\frac{2}{2}$ and the $\frac{1}{2}$ Nancy had $= \frac{3}{2}$.

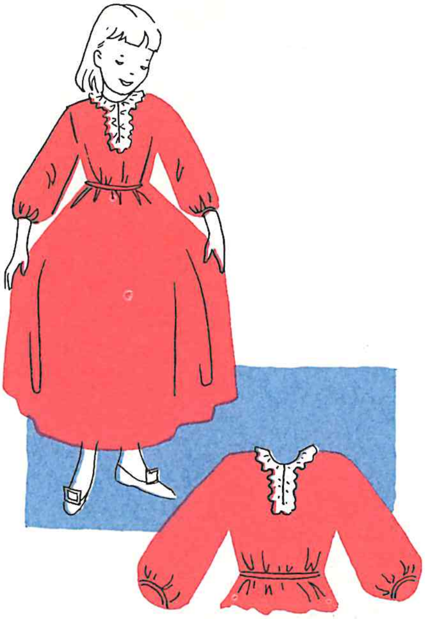
Now she can subtract the fractions ($\frac{3}{4}$ from $\frac{3}{2} = ?$) if she will change them to like fractions. What must be done with the $\frac{3}{2}$? Nancy will have $\frac{3}{4}$ yd. left from the shorter piece.

1. Nancy is folding the longer piece of cloth to make the skirt. The cloth is $1\frac{1}{2}$ yd. long, doubled. Nancy wants her skirt to be 33 in. long so that it will just touch the top of her slippers. How much cloth is left?

Subtract:

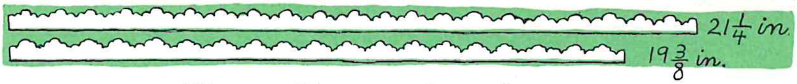
	a.	b.	c.	d.	e.	f.
2.	$\begin{array}{r} 3\frac{2}{8} \\ 1\frac{7}{8} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{5} \\ 2\frac{3}{5} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{4} \\ 3\frac{3}{4} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{5}{8} \\ 1\frac{7}{8} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{1}{3} \\ 2\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 8\frac{5}{9} \\ 2\frac{2}{9} \\ \hline \end{array}$

Nancy's Dress



Nancy is as happy as a lark with her dress, but she wants to sew a little lace or ribbon on it. She thought a little lace around the neck might be pretty. Her mother said she could have the piece of lace in the sewing box if it was long enough.

1. Nancy measured the piece of lace and found that it was $21\frac{1}{4}$ in. long. She needs a piece $19\frac{3}{8}$ in. long. How much lace will be left so she will know if she has enough for the top of a pocket?


$21\frac{1}{4}$ in.
$19\frac{3}{8}$ in.

$$\begin{array}{r} 21\frac{1}{4} \\ -\ 19\frac{3}{8} \\ \hline \end{array}$$

Nancy knows that she cannot subtract the fractions until they are like fractions. What changes must she make in the mixed numbers?

$$\begin{array}{r} 21\frac{1}{4} \\ -\ 19\frac{3}{8} \\ \hline \end{array} = \begin{array}{r} 21\frac{2}{8} \\ -\ 19\frac{3}{8} \\ \hline \end{array}$$

Now that she has like fractions, Nancy can begin to subtract. She subtracts the fractions first.

She finds that she cannot subtract $\frac{3}{8}$ from $\frac{2}{8}$. What would you do?

Where are you going to find more of the eighths so you can subtract?

When you use a whole, you must use it as eighths. Why?

How many eighths are there in a whole?

Finish the work.

Nancy will have ? in. of lace left.

2. Change these fractions to like fractions and subtract:

a.	**b.**	**c.**	**d.**	**e.**	**f.**
$\begin{array}{r} 4\frac{1}{2} \\ -\ 1\frac{7}{8} \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{4} \\ -\ 2\frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} 7\frac{5}{9} \\ -\ 5\frac{2}{3} \\ \hline \end{array}$	$\begin{array}{r} 2\frac{2}{3} \\ -\ 1\frac{4}{6} \\ \hline \end{array}$	$\begin{array}{r} 3\frac{1}{4} \\ -\ 1\frac{5}{8} \\ \hline \end{array}$	$\begin{array}{r} 5\frac{1}{4} \\ -\ 2\frac{7}{12} \\ \hline \end{array}$

Subtraction—Needing More Fractional Parts

Subtracting Mixed Numbers

Subtract these mixed numbers. Always be sure to change the fractions to the lowest terms:

	a.	b.	c.	d.	e.	f.
1.	$4\frac{2}{3}$ $2\frac{2}{3}$	$6\frac{3}{4}$ $3\frac{1}{4}$	$8\frac{7}{8}$ $3\frac{3}{8}$	$6\frac{9}{12}$ $5\frac{2}{12}$	$9\frac{6}{10}$ $3\frac{2}{10}$	$7\frac{8}{9}$ $5\frac{2}{9}$
2.	$5\frac{2}{5}$ $3\frac{4}{5}$	$15\frac{2}{9}$ $8\frac{3}{9}$	$4\frac{1}{8}$ $1\frac{5}{8}$	$13\frac{6}{7}$ $9\frac{2}{7}$	$5\frac{1}{4}$ $2\frac{3}{4}$	$15\frac{8}{12}$ $7\frac{2}{12}$
3.	$9\frac{1}{4}$ $2\frac{3}{8}$	$6\frac{5}{9}$ $3\frac{1}{3}$	$2\frac{5}{6}$ $1\frac{1}{3}$	$11\frac{1}{3}$ $2\frac{11}{12}$	$12\frac{1}{6}$ $8\frac{5}{12}$	$17\frac{7}{9}$ $5\frac{15}{18}$
4.	$6\frac{3}{4}$ $2\frac{7}{8}$	$10\frac{9}{15}$ $3\frac{2}{3}$	$7\frac{4}{8}$ $1\frac{9}{16}$	$13\frac{1}{3}$ $5\frac{5}{6}$	$17\frac{1}{5}$ $6\frac{7}{10}$	$8\frac{1}{4}$ $2\frac{7}{8}$

Change these mixed numbers to improper fractions, then subtract:

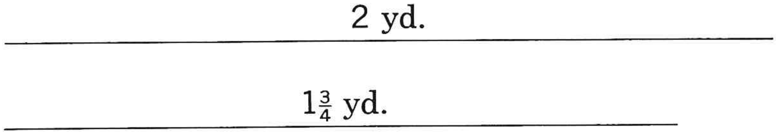
$$\begin{array}{r} 6\frac{4}{9} \\ -\,2\frac{1}{3} \\ \hline \end{array} = \begin{array}{r} 6\frac{4}{9} \\ -\,2\frac{3}{9} \\ \hline \end{array} = \begin{array}{r} \frac{58}{9} \\ -\,\frac{21}{9} \\ \hline \frac{37}{9} \end{array} = 4\frac{1}{9}$$

5.	$2\frac{1}{5}$ $1\frac{1}{15}$	$1\frac{6}{7}$ $1\frac{1}{14}$	$3\frac{1}{3}$ $1\frac{2}{6}$	$1\frac{1}{4}$ $1\frac{1}{8}$	$2\frac{5}{8}$ $1\frac{1}{4}$	$2\frac{2}{3}$ $1\frac{1}{3}$
6.	$9\frac{1}{4}$ $1\frac{3}{8}$	$5\frac{1}{2}$ 3	$2\frac{3}{4}$ $1\frac{1}{4}$	$9\frac{1}{3}$ $3\frac{2}{6}$	$5\frac{1}{2}$ $2\frac{1}{6}$	$8\frac{1}{2}$ $1\frac{1}{12}$

Do you think that you could subtract a mixed number from a whole number? Try this problem:

7. Nancy has a piece of cloth that is 2 yd. long. She wants to cut off a piece that is $1\frac{3}{4}$ yd. long. How many yards will she have left?

$$\begin{array}{r} 2 \\ -\,1\frac{3}{4} \\ \hline ? \end{array}$$



What must you do to one of the 2 yd. to find what is left? Find what is left, using numbers.

Practice Problems and Exercises

1. Nancy had some red cloth left, so she is going to make a sash for her dress. One piece of cloth is 9 in. long. The other piece is $1\frac{1}{3}$ yd. long. If Nancy uses both of these pieces, how long can her sash be?

2. Nancy needs an apron which comes to the bottom of her skirt. Mother said she could have a piece of cloth that is $1\frac{3}{4}$ yd. long. How much cloth will be left if Nancy's apron is $3\frac{1}{2}$ ft. long?

3. Two of the boys brought coonskin caps to school. The tail on Ted's cap is $\frac{3}{4}$ yd. long. The tail on Bill's cap is 1 ft. long. Find the differences in the lengths of the tails (use fractions).

4. Ronnie brought a piece of balsa wood to school to carve animals for the fireplace mantel. The piece was $\frac{1}{2}$ yd. long when Ronnie brought it. It is only $\frac{1}{6}$ yd. long now. How much has been used?

5. A new boy came into the class. John is helping him to make a musket. The boys found a piece of wood 2 yd. 9 in. long. They can make a musket from this piece. They want the musket to be $4\frac{1}{2}$ ft. long. How much wood will be left?

Subtract:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**
6.	$6\frac{3}{4}$ $1\frac{1}{4}$	$2\frac{8}{9}$ $1\frac{1}{18}$	$3\frac{7}{12}$ $1\frac{3}{12}$	$6\frac{1}{2}$ 2	$3\frac{4}{12}$ $1\frac{1}{3}$	$6\frac{7}{9}$ $5\frac{1}{3}$
7.	$16\frac{3}{4}$ 8	$9\frac{6}{8}$ $2\frac{2}{8}$	$9\frac{1}{4}$ $2\frac{2}{4}$	$9\frac{8}{9}$ 7	$4\frac{3}{4}$ $2\frac{7}{8}$	$6\frac{1}{2}$ $2\frac{1}{2}$
8.	$7\frac{5}{9}$ $1\frac{2}{3}$	$9\frac{1}{12}$ $1\frac{7}{12}$	$4\frac{1}{2}$ $1\frac{1}{4}$	$2\frac{3}{4}$ $1\frac{1}{4}$	$2\frac{1}{2}$ $1\frac{1}{8}$	$1\frac{3}{4}$ $\frac{7}{8}$

Can You Do All of These?

1. Change to lowest terms:

a. $\frac{6}{8}$, $\frac{10}{12}$, $\frac{4}{6}$
b. $\frac{12}{16}$, $\frac{2}{4}$, $\frac{2}{8}$
c. $\frac{4}{8}$, $\frac{2}{12}$, $\frac{10}{20}$

d. $\frac{4}{12}$, $\frac{3}{6}$, $\frac{8}{16}$
e. $\frac{5}{10}$, $\frac{18}{20}$, $\frac{7}{14}$
f. $\frac{8}{12}$, $\frac{5}{15}$, $\frac{7}{21}$

g. $\frac{10}{16}$, $\frac{8}{10}$, $\frac{4}{14}$
h. $\frac{6}{12}$, $\frac{16}{20}$, $\frac{3}{15}$
i. $\frac{12}{16}$, $\frac{10}{15}$, $\frac{3}{12}$

Add:

	a.	b.	c.	d.	e.
2.	$3\frac{5}{8}$ $2\frac{3}{8}$	$4\frac{5}{6}$ $1\frac{1}{6}$	$4\frac{2}{8}$ $2\frac{3}{8}$	$3\frac{6}{7}$ $1\frac{2}{7}$	$9\frac{3}{4}$ $2\frac{1}{4}$
3.	$3\frac{3}{8}$ $1\frac{1}{4}$	$4\frac{5}{6}$ $2\frac{1}{2}$	$6\frac{7}{10}$ $2\frac{1}{2}$	$8\frac{9}{10}$ $2\frac{2}{5}$	$3\frac{11}{12}$ $1\frac{7}{12}$
4.	$9\frac{3}{4}$ $2\frac{1}{8}$	$5\frac{2}{6}$ $2\frac{1}{12}$	$4\frac{2}{3}$ $2\frac{1}{12}$	$3\frac{4}{5}$ $2\frac{1}{10}$	$8\frac{5}{8}$ $2\frac{1}{4}$
5.	$2\frac{3}{4}$ $1\frac{3}{8}$	$3\frac{7}{8}$ $1\frac{5}{16}$	$2\frac{4}{5}$ $1\frac{4}{10}$	$3\frac{4}{7}$ $1\frac{1}{14}$	$2\frac{5}{9}$ $1\frac{1}{3}$

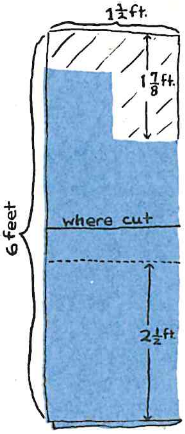
Subtract:

6.	$3\frac{3}{8}$ $1\frac{1}{8}$	$2\frac{5}{6}$ $1\frac{1}{6}$	$3\frac{4}{5}$ $1\frac{2}{5}$	$1\frac{8}{9}$ $1\frac{5}{9}$	$3\frac{2}{3}$ $2\frac{1}{3}$
7.	$3\frac{7}{8}$ $1\frac{3}{4}$	$5\frac{5}{6}$ $4\frac{2}{3}$	$7\frac{1}{2}$ $3\frac{1}{4}$	$4\frac{3}{10}$ $2\frac{1}{5}$	$3\frac{7}{12}$ $2\frac{1}{4}$
8.	$4\frac{2}{3}$ 2	$7\frac{1}{2}$ 5	$11\frac{3}{4}$ 8	$2\frac{5}{8}$ 2	$10\frac{1}{6}$ 6

Change fractions to mixed numbers and subtract:

9.	$\frac{9}{4}$ 1	$\frac{11}{2}$ 3	$\frac{18}{5}$ 2	$\frac{13}{3}$ 3	$\frac{19}{6}$ 2

10. $\frac{19}{3} - \frac{13}{6}$ $\quad$ $\frac{15}{2} - \frac{9}{4}$ $\quad$ $\frac{12}{5} - \frac{11}{10}$ $\quad$ $\frac{27}{4} - \frac{17}{2}$



$1\frac{1}{2}$ ft.
$1\frac{7}{8}$ ft.
6 feet
where cut
$2\frac{1}{2}$ ft.

A Pioneer Dress for Josephine

Josephine saw Nancy's pioneer dress, and she had to have one like it. Josephine's mother had a bed sheet that she gave to Josephine. Josephine dyed it a light blue—the color of the summer sky.

The sheet was 6 ft. long. Josephine cut it into halves. She then cut a $2\frac{1}{2}$ ft. length from one piece. How much cloth will be left from half of the sheet?

$$\begin{array}{r} 3 \\ -\,2\frac{1}{2} \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ -\,2\frac{1}{2} \\ \hline \end{array} = \begin{array}{r} 2\frac{2}{2} \\ -\,2\frac{1}{2} \\ \hline \end{array}$$

Josephine has nothing from which to subtract the $\frac{1}{2}$. She uses one of the 3 wholes. Why must she use this whole as halves?

Now she can subtract the fractions: $\frac{2}{2} - \frac{1}{2} = ?$ She subtracts the wholes. She used 1 of the 3 wholes, so she has 2 wholes left. 2 from 2 = ? Josephine has ? yd. left.

1. Josephine wants her skirt to be full, so she is using $1\frac{1}{4}$ yd. from the other half of the sheet. How much of this piece is left?

2. Subtract:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
6	7	2	7	4	9	8
$1\frac{1}{4}$	$5\frac{1}{2}$	$1\frac{1}{6}$	$3\frac{2}{3}$	$2\frac{6}{7}$	$6\frac{4}{5}$	$2\frac{1}{10}$

Josephine Trims Her Dress

1. Josephine is going to make a large white collar to wear on her dress. Her mother gave her a piece of white organdy 1 ft. wide and just the right length. Josephine wants her collar to be $\frac{1}{4}$ yd. wide. What is the width of the piece of cloth that will be left?

2. Josephine has a piece of blue cloth that is $\frac{1}{3}$ yd. wide. She is going to make a sunbonnet. The bill of the sunbonnet will be $\frac{1}{4}$ yd. wide. She will need twice this length on each side of the piece of cloth to make it. How much too narrow is the piece of blue cloth to give her what she needs?

3. If Josephine uses the 1 ft. width of cloth to make the back of the sunbonnet, how wide a strip will she have left if she uses a piece $\frac{1}{6}$ yd. wide?

4. Josephine is using two strips of cloth for the ties. The piece she is using to make them is $2\frac{1}{2}$ ft. long. How much will be left if she uses 2 ft. for the ties?

Subtract:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**
5.	6 $2\frac{2}{3}$	8 $1\frac{5}{6}$	2 $\frac{7}{8}$	8 $4\frac{1}{2}$	15 $1\frac{1}{4}$	9 $4\frac{6}{7}$
6.	$4\frac{1}{3}$ $2\frac{5}{6}$	$9\frac{1}{2}$ $1\frac{1}{2}$	$6\frac{4}{5}$ 5	$7\frac{1}{8}$ $2\frac{3}{4}$	$6\frac{3}{12}$ $2\frac{9}{12}$	$14\frac{7}{8}$ $5\frac{3}{4}$

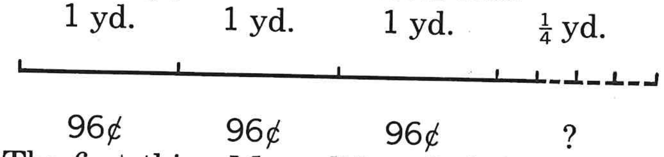
Practice in Subtracting Fractions

Figuring Costs

When all the girls decided they must have pioneer dresses, Miss Barr said that if they brought their own cloth to school, they could make the dresses. Nancy and Josephine would be special helpers.

Mary went downtown right after school with the money from her allowance to buy the cloth for her dress. She chose cloth that cost 96¢ a yard. She needs $3\frac{1}{4}$ yd. Find the total cost.

$$\boxed{\begin{array}{r} 96\text{¢} \\ \times\ 3\frac{1}{4} \\ \hline \end{array}}$$



The first thing Mary did to find the cost of the cloth was to multiply 3 × 96¢. Why?

She needs $\frac{1}{4}$ of a yd. more than the 3 yd.

In order to find how much $\frac{1}{4}$ of a yard would cost, she divided the cost of 1 yd. into 4 equal parts.

$$\begin{array}{r} 96\text{¢} \\ \times\ 3 \\ \hline 288 \\ 24 \\ \hline \$3.12 \end{array}$$

$$\begin{array}{r} 24 \\ 4\overline{)96} \end{array}$$

1. What was the cost of $\frac{1}{4}$ yd. of cloth?

2. Add the cost of the 3 yd. and the cost of the $\frac{1}{4}$ yd. to find how much Mary must pay altogether.

3. Show that Mary could have added to find the cost of 3 yd. of cloth. Which is shorter, adding or multiplying?

$$\begin{array}{r} \$.96 \\ .96 \\ +\ .96 \\ \hline \end{array}$$

4. If Mary had chosen cloth that cost 81¢ a yd., how much would $3\frac{1}{3}$ yd. have cost her?

5. Betsy went with Mary to buy the cloth for her dress. She needs $3\frac{1}{2}$ yd. The cloth she bought cost 86¢ a yd. Find the total cost. (Some people like to multiply by the fraction as the first step.)

$$\begin{array}{r} 86\text{¢} \\ \times\ 3\frac{1}{2} \\ \hline 43 \\ 258 \\ \hline \end{array} \qquad 2\overline{)86\text{¢}}$$

6. What will $2\frac{1}{4}$ yd. of tape cost Betsy if the price is 16¢ a yard?

Shopping

1. Find the cost of $2\frac{1}{3}$ yd. of cloth at 75¢ a yard.
  a. Find the cost of 2 yd.
  b. Find the cost of $\frac{1}{3}$ yd. $3\overline{)75¢}$
  c. Add to find the total.

2. Find the cost of $4\frac{1}{4}$ yd. at 60¢ a yd.
  a. Find the cost of $\frac{1}{4}$ yd. $4\overline{)60¢}$
  b. Find the cost of 4 yd.
  c. Add to find the total cost.

3. Find the cost of $3\frac{1}{2}$ yd. of braid at 42¢ per yard.

4. Find the cost of $4\frac{1}{4}$ yd. of lace at 24¢ a yard.

5. Find the cost of $5\frac{1}{3}$ yd. of tape at 21¢ a yard.

6. Find the cost of $4\frac{3}{4}$ yd. of elastic at 24¢ a yard.

7. Joyce went downtown to buy enough cloth 36 in. wide to make a sunbonnet, a shawl, and a sash of the same flowered cloth. She needs $1\frac{1}{2}$ yd. for the sunbonnet, $2\frac{1}{4}$ yd. for the shawl, and 6 in. for the sash.

a. Find the total number of yards she needs.

b. The price was 40¢ a yard. Find the cost of the amount she needed.

8. Joyce's mother asked her to stop at the grocery store on her way home and buy some things for dinner.

a. She bought $\frac{1}{2}$ doz. peppers at 32¢ a dozen. How much did they cost?

b. She bought 3 boxes of vanilla wafers. How many dozen did she buy?

c. Joyce bought pork chops that weighed 2 lb. 2 oz. How much did they cost at 72¢ a pound?

9. Find these amounts:

a.	**b.**	**c.**	**d.**	**e.**	**f.**
32	68	75	48	96	42
$\times 1\frac{1}{2}$	$\times 1\frac{1}{4}$	$\times 2\frac{1}{5}$	$\times 2\frac{1}{6}$	$\times 2\frac{1}{3}$	$\times 1\frac{1}{7}$

The Boys Make a Pioneer Outfit

The boys decided that they would like to have pioneer outfits. Miss Barr said she would buy the unbleached muslin and dye it green if the boys would pay for the amount of the cloth they used. The boys thought it was a good idea.

Jim needs 2 yd. 24 in. for his jerkin. The muslin cost 36¢ a yard.

Jim multiplied to find how much 2 yd. cost.

He needs to find how much $\frac{2}{3}$ of a yard would cost. He divided the cost of 1 yd. into 3 equal parts.

One of the thirds ($\frac{1}{3}$ yd.) will cost 12¢.

Jim knows that $\frac{2}{3}$ yd. = 2 of the $\frac{1}{3}$ yd., so $\frac{2}{3}$ yd. will cost 2 × 12¢.

Jim added this amount to the cost of 2 yd. His jerkin cost $.96.

$$\begin{array}{r} 36 \\ \times\ 2 \\ \hline 72 \end{array}$$

$$3\overline{)36}\quad 12$$

$$\begin{array}{r} 12 \\ \times\ 2 \\ \hline 24 \end{array}$$

$$\begin{array}{r} 36¢ \\ \times\ 2\frac{2}{3} \\ \hline 24 \\ 72 \\ \hline 96¢ \end{array}$$

Explain this.

1. Jim needs $3\frac{3}{4}$ yd. for his trousers. Find the cost.

2. Find the total cost of his pioneer outfit.

3. Multiply:

a. $20 \times 2\frac{2}{5}$

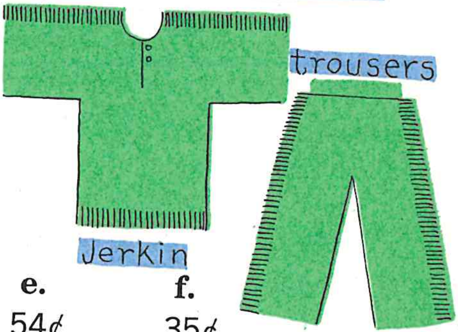
b. $32 \times 2\frac{3}{4}$

c. $88 \times 1\frac{3}{4}$

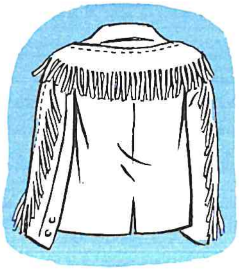
d. $93¢ \times 3\frac{2}{3}$

e. $54¢ \times 2\frac{2}{9}$

f. $35¢ \times 2\frac{3}{5}$



Problems and Exercises



Find the costs of these, if the cloth sells at 36¢ a yard:

1. Tim is very tall and straight. He knew that he needed a lot of cloth, so he brought his allowance to pay for it. His jerkin took $2\frac{5}{6}$ yd. and his trousers took $3\frac{1}{2}$ yd. Find the cost of Tim's outfit.

2. David needed only the trousers. They took 3 yd. 28 in. Find the cost of his trousers.

3. David is using a brown jacket for his jerkin. He bought $\frac{3}{4}$ yd. of the muslin to use as fringe on his sleeves and across the back of the jacket. Find the cost.

4. Pete used an old brown pair of trousers for his outfit. He bought 32 in. of cloth to make the fringe. Find the cost.

Find these amounts:

5. Bill bought $3\frac{5}{9}$ yd. of brown cloth at 54¢ a yard.

a. Find the cost of 3 yd.

b. Find the cost of $\frac{1}{9}$ yd. $\begin{array}{r} ?\text{¢} \\ 9\overline{)54\text{¢}} \end{array}$

c. $\frac{5}{9}$ yd. would be 5 of the $\frac{1}{9}$ yd. or $\begin{array}{r} ?\text{¢} \\ \underline{\times\ 5} \end{array}$

d. Add the two amounts to find the total cost.

6. Henry bought $3\frac{7}{8}$ yd. of cloth at 72¢ a yard.

a. Find the cost of $\frac{1}{8}$ yd. of cloth. $\begin{array}{r} ?\text{¢} \\ 8\overline{)72\text{¢}} \end{array}$

b. $\frac{7}{8}$ yd. would be 7 of the $\frac{1}{8}$ yd. or $7 \times ?\text{¢} = ?$

c. Find the cost of 3 yd.

d. Add the two amounts to find the total cost.

Multiply:

	a.	b.	c.	d.	e.	f.
7.	$75 \times 2\frac{4}{5}$	$36 \times 2\frac{2}{9}$	$45 \times 3\frac{1}{3}$	$69 \times 2\frac{2}{3}$	$81 \times 4\frac{3}{9}$	$56 \times 2\frac{4}{7}$
8.	$63 \times 2\frac{1}{9}$	$57 \times 9\frac{2}{3}$	$68 \times 8\frac{1}{4}$	$54 \times 7\frac{1}{9}$	$66 \times 7\frac{1}{3}$	$64 \times 7\frac{3}{8}$

A Practice Page

Add:

	a.	b.	c.	d.	e.	f.
1.	$2\frac{1}{2}$ $3\frac{1}{4}$	$6\frac{5}{7}$ $2\frac{1}{14}$	$1\frac{6}{7}$ $1\frac{2}{14}$	$5\frac{1}{3}$ $2\frac{4}{6}$	$3\frac{1}{2}$ $2\frac{5}{8}$	$2\frac{1}{3}$ $2\frac{1}{3}$
2.	$2\frac{3}{10}$ $1\frac{4}{5}$	6 $2\frac{4}{9}$	$2\frac{3}{4}$ 4	$3\frac{1}{9}$ $1\frac{2}{3}$	$2\frac{3}{10}$ $1\frac{1}{20}$	$3\frac{1}{4}$ $1\frac{7}{8}$
3.	$2\frac{5}{8}$ $\frac{1}{2}$	$5\frac{7}{8}$ $1\frac{1}{4}$	$2\frac{1}{4}$ $1\frac{1}{4}$	$3\frac{1}{8}$ 2	$1\frac{1}{6}$ $1\frac{3}{6}$	$1\frac{1}{3}$ $2\frac{1}{9}$

Subtract:

4.	2 $1\frac{1}{2}$	$1\frac{5}{8}$ $\frac{1}{8}$	$3\frac{2}{3}$ $1\frac{1}{3}$	$2\frac{1}{4}$ 1	$5\frac{1}{4}$ $2\frac{6}{8}$	$2\frac{1}{5}$ $1\frac{1}{10}$
5.	$9\frac{1}{3}$ $1\frac{1}{6}$	$6\frac{1}{4}$ $1\frac{1}{2}$	$8\frac{8}{9}$ $2\frac{1}{9}$	5 $2\frac{3}{8}$	$6\frac{1}{2}$ 5	$6\frac{5}{9}$ $1\frac{2}{3}$

Multiply:

6.	26 $2\frac{1}{2}$	14¢ $2\frac{1}{2}$	$\$.98$ $2\frac{1}{4}$	40 $2\frac{3}{10}$	63¢ $3\frac{1}{9}$	$\$.20$ $6\frac{1}{2}$
7.	48¢ $2\frac{1}{6}$	39¢ $2\frac{2}{3}$	24 $1\frac{5}{6}$	42 $3\frac{2}{6}$	$\$.56$ $3\frac{7}{8}$	12 $3\frac{1}{2}$
8.	$3\frac{5}{16}$ $+\ 2\frac{3}{4}$	9 $-\ 7\frac{4}{5}$	$6\frac{3}{5}$ $-\ 4\frac{3}{5}$	$8\frac{5}{8}$ $+\ 7\frac{3}{8}$	$6\frac{7}{12}$ $-\ 3\frac{1}{4}$	$3\frac{7}{8}$ $+\ 4\frac{7}{16}$
9.	$8\frac{1}{8}$ $+\ \frac{8}{8}$	$7\frac{1}{8}$ $-\ \frac{8}{8}$	$6\frac{5}{8}$ $-\ 1\frac{5}{8}$	$3\frac{1}{4}$ $+\ 2\frac{9}{12}$	$2\frac{3}{4}$ $-\ 2\frac{6}{8}$	5 $+\ 1\frac{7}{7}$

10. $1\frac{3}{8} \times 24$ $2\frac{3}{10} \times 10$ $4\frac{1}{5} \times 5$ $3\frac{2}{3} \times 9$

An Old-Fashioned Taffy Pull

Jerry and Debby asked the children in their room to come over to their home for an old-fashioned taffy pull. The recipe they used called for $2\frac{1}{2}$ cups of sugar. They need to make 3 times this amount, so there will be enough taffy for everyone. $3 \times 2\frac{1}{2} = ?$

$$\begin{array}{r} 2\frac{1}{2} \\ \times\ 3 \\ \hline 1\frac{1}{2} \\ 6 \\ \hline 7\frac{1}{2} \text{ cups} \end{array}$$

They figured three $\frac{1}{2}$ cups of sugar first. This means that they need $\frac{1}{2}$ cup 3 times, or $3 \times \frac{1}{2} = \frac{3}{2}$. Why? $\frac{3}{2}$ cups $= 1\frac{1}{2}$ cups. Write $1\frac{1}{2}$ below the line. Then they figure the wholes. $3 \times 2 = 6$. Write 6 under the 1 in $1\frac{1}{2}$. Add to find the sum. They need $7\frac{1}{2}$ cups of sugar. Could they have multiplied the wholes first? Why?

1. The recipe calls for $1\frac{1}{8}$ cups of light corn syrup. How much is 3 times this amount?

2. The children made a black walnut cream taffy that called for $\frac{3}{4}$ cup of water. They multiplied the recipe by 3 to make enough.

$3 \times \frac{3}{4} = ?$ (Check this by adding $\frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{?}{4}$.)

They needed ? cups of water.

3. This recipe calls for $\frac{1}{2}$ cup chopped walnuts. Use 3 times this amount to find how many cups of walnuts are needed.

4. Multiply these fractions:

a.	**b.**	**c.**	**d.**	**e.**
$3 \times \frac{3}{4} = ?$	$5 \times \frac{1}{2} = ?$	$6 \times \frac{3}{7} = ?$	$8 \times \frac{1}{4} = ?$	$2 \times \frac{5}{6} = ?$

Multiply:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**
5.	$\begin{array}{r} 2\frac{1}{2} \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} 3\frac{1}{4} \\ \times\ 6 \\ \hline \end{array}$	$\begin{array}{r} 7\frac{1}{3} \\ \times\ 4 \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{4} \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} 1\frac{1}{2} \\ \times\ 7 \\ \hline \end{array}$	$\begin{array}{r} 2\frac{3}{8} \\ \times\ 2 \\ \hline \end{array}$
6.	$\begin{array}{r} 2\frac{1}{2} \\ \times\ 2 \\ \hline \end{array}$	$\begin{array}{r} 3\frac{1}{8} \\ \times\ 5 \\ \hline \end{array}$	$\begin{array}{r} 6\frac{1}{10} \\ \times\ 6 \\ \hline \end{array}$	$\begin{array}{r} 4\frac{1}{2} \\ \times\ 3 \\ \hline \end{array}$	$\begin{array}{r} 1\frac{4}{9} \\ \times\ 2 \\ \hline \end{array}$	$\begin{array}{r} 3\frac{1}{3} \\ \times\ 6 \\ \hline \end{array}$

Traveling Across Country

1. David's grandmother told him that when her mother crossed the plains, it took $1\frac{1}{2}$ hours to go a mile while they were in the mountains. How long would it take to travel 8 mi. in mountain country?

2. The pioneers could travel faster when they were on the plains. They sometimes went 4 miles in an hour. How far could they go in $10\frac{3}{4}$ hr. on the plains?

3. It took them $2\frac{1}{2}$ hours to repair a broken wheel. How much time did they lose in one day when they had 3 broken wheels?

4. David read a diary his great-grandmother had written. She wrote that they used $9\frac{3}{4}$ lb. of beans each week on the trail. How many pounds did they use in 6 weeks?

5. His great-grandmother wrote that she was allowed to bring only 2 party dresses. Each dress was made from $6\frac{7}{8}$ yd. of cloth. Multiply to find how many yards of cloth were used in both dresses. Check your answer by adding.

Multiply:

	a.	**b.**	**c.**	**d.**	**e.**	**f.**
6.	$6 \times 2\frac{1}{2}$	$3\frac{3}{4} \times 4$	$12\frac{2}{3} \times 6$	$15 \times 2\frac{1}{3}$	$9\frac{1}{7} \times 3$	$7\frac{2}{7} \times 7$
7.	$12 \times 6\frac{3}{4}$	$9 \times 2\frac{1}{3}$	$10\frac{1}{2} \times 7$	$2\frac{5}{8} \times 8$	$10 \times 3\frac{2}{5}$	$3 \times 3\frac{2}{3}$

Practice Work

1. David's grandfather told him that he used to make snow ice cream when he was a boy. He used $1\frac{1}{2}$ cups of cream, $2\frac{3}{4}$ tablespoons of sugar, and 2 cups of snow to make a bowl of snow ice cream. Double this recipe.

2. David's grandfather remembers that one winter day he and his brother used all the cream making 5 bowls of snow ice cream. Find how much cream and how much sugar the boys used.

3. Grandfather remembers that during the year of the big snow, his mother used only $1\frac{1}{2}$ cups of flour each day for the 12 days they were snowed in. How much flour did she use in that time?

4. Grandfather told David that his father gave him and each of his 7 brothers $2\frac{1}{2}$ acres of land along Rawhide Creek, so they could raise a small crop for themselves. How many acres did all the boys have?

5. Grandfather raised a few rows of sweet corn on part of his land and sold the corn to the village people. He sold it at 10¢ for a dozen ears. How much did he receive for $2\frac{1}{2}$ doz. ears of sweet corn?

Multiply:

	a.	b.	c.	d.	e.	f.
6.	$14\frac{1}{3}$ 7	6 $2\frac{1}{3}$	$4\frac{1}{2}$ 9	$3\frac{2}{3}$ 9	$17\frac{6}{7}$ 3	8 $9\frac{3}{4}$
7.	16 $5\frac{1}{2}$	$4\frac{1}{4}$ 4	$2\frac{7}{8}$ 6	2 $7\frac{1}{4}$	$4\frac{1}{9}$ 9	$\frac{7}{8}$ 5
8.	$3\frac{5}{8}$ 4	7 $3\frac{1}{3}$	2 $2\frac{1}{2}$	$6\frac{5}{12}$ 5	5 $3\frac{3}{5}$	$2\frac{3}{4}$ 3
9.	10 $2\frac{2}{5}$	$3\frac{1}{8}$ 8	12 $2\frac{1}{12}$	16 $3\frac{1}{8}$	15 $5\frac{1}{3}$	$7\frac{3}{4}$ 8

A Practice Page

Add:

	a.	b.	c.	d.	e.	f.
1.	$\frac{1}{4}$ $\frac{1}{4}$	$2\frac{1}{2}$ 5	$8\frac{5}{12}$ $9\frac{5}{12}$	$6\frac{1}{4}$ 2 $9\frac{3}{4}$	$4\frac{1}{3}$ $2\frac{1}{3}$	$9\frac{1}{4}$ $6\frac{1}{4}$ $7\frac{1}{4}$
2.	$\frac{1}{8}$ $\frac{1}{8}$	$2\frac{1}{2}$ $3\frac{1}{6}$	$2\frac{7}{8}$ $1\frac{1}{2}$	$3\frac{3}{6}$ $2\frac{1}{6}$	$4\frac{1}{6}$ $1\frac{4}{12}$	$9\frac{3}{8}$ $1\frac{1}{8}$

Subtract:

3.	$\frac{3}{4}$ $\frac{1}{4}$	$6\frac{2}{3}$ $4\frac{1}{3}$	$\frac{7}{8}$ $\frac{5}{8}$	$8\frac{3}{8}$ 4	$2\frac{1}{2}$ $1\frac{1}{4}$	7 $2\frac{1}{2}$
4.	$7\frac{1}{4}$ $1\frac{5}{8}$	$6\frac{1}{4}$ 2	$5\frac{5}{9}$ $2\frac{1}{9}$	$3\frac{3}{4}$ $\frac{5}{8}$	6 $1\frac{2}{5}$	$2\frac{1}{4}$ $1\frac{7}{8}$

Multiply:

5.	$3\frac{1}{6}$ $\times 8$	8 $\times 2\frac{1}{2}$	15 $\times 6\frac{1}{5}$	$3\frac{2}{3}$ $\times 2$	$4\frac{1}{2}$ $\times 4$	9 $\times 2\frac{1}{3}$
6.	7 $\times 7\frac{1}{7}$	80¢ $\times 2\frac{1}{2}$	98¢ $\times 1\frac{1}{2}$	69¢ $\times 2\frac{2}{3}$	75¢ $\times 1\frac{1}{5}$	50¢ $\times 2\frac{1}{10}$

7. Grandpa said he rode $8\frac{7}{8}$ mi. on horseback to the country school when he was a boy. How far did he ride in going to and from school each day?

8. How far did he ride in a week of 5 school days in going to and from school?

9. David's grandfather asked him if he had figured how many miles he rode each week in the school bus. David said, "No, but it is a lot of miles."

Will you figure this for David?
$8\frac{3}{4} + 8\frac{3}{4} + 8\frac{3}{4} + 8\frac{3}{4} + 8\frac{3}{4} = ?$
$5 \times 8\frac{3}{4} = ?$
Do your answers agree?

Have You Been Storing Knowledge?

Pioneers always got ready for winter by canning and storing food. Try these story problems about their work.

1. The women cooked sausage patties and packed them in $7\frac{1}{2}$ gal. crocks. How many gallons of sausage patties were in 5 of these crocks?

2. It took $3\frac{1}{2}$ qt. of lard to cover the sausages in the smaller crocks and $6\frac{3}{4}$ qt. of lard for the larger crocks. How many more quarts of lard did it take for the larger crocks than for the smaller ones?

3. Jenny helped her mother pack $2\frac{1}{2}$ doz. cucumbers in a crock to make pickles. She also helped pack 5 doz. in a larger crock. How many more dozen were there in the larger crock?

4. All the boys helped carry squash to the cave. They carried $4\frac{5}{6}$ dozen on Saturday morning. They finished carrying the rest on Monday when they carried $6\frac{2}{3}$ dozen. How many dozen squash were in the cave?

5. Pete helped his big brother store potatoes in the cave. Pete carried $6\frac{3}{4}$ bu. before supper and $8\frac{1}{2}$ bu. after supper. How many bushels did he carry altogether?

6. It was Jim and Tim's job to tie peppers in bunches to dry. They tied $1\frac{3}{4}$ doz. in one bunch, and $1\frac{1}{2}$ doz. in another bunch. How many dozen peppers were there in the 2 bunches?

7. Mother and Jenny canned 3 pt. of wild strawberries one day and $1\frac{1}{2}$ pints the next day. How many pints did they have in all?

8. Jenny and Tim picked enough wild elderberries to make 4 pint jars and a half-pint jar of jelly. The next day they picked enough to make 3 pint jars and a half-pint jar. Find how many pints of jelly they had.

9. Mother made $7\frac{1}{4}$ lb. of head cheese from the first butchering and $5\frac{5}{8}$ lb. from the second butchering. Find how much head cheese she made from both butcherings.

Unit Test

Multiply:

	a.	b.	c.	d.	e.	f.
1.	$2\frac{3}{4}$ $\times 2$	6 $\times 3\frac{1}{3}$	7 $\times 2\frac{1}{7}$	$6\frac{1}{2}$ $\times 6$	$4\frac{3}{10}$ $\times 6$	$5\frac{2}{3}$ $\times 2$
2.	80¢ $\times 2\frac{7}{8}$	60¢ $\times 2\frac{7}{10}$	45¢ $\times 2\frac{1}{5}$	90¢ $\times 2\frac{1}{2}$	78¢ $\times 3\frac{3}{4}$	42¢ $\times 3\frac{1}{6}$

Add:

3.	$2\frac{1}{2}$ 3	$6\frac{3}{4}$ $1\frac{5}{8}$	$4\frac{1}{4}$ $2\frac{3}{4}$	$7\frac{1}{8}$ $2\frac{1}{8}$	14 $2\frac{5}{6}$	$2\frac{1}{3}$ $2\frac{2}{6}$
4.	$6\frac{1}{12}$ $4\frac{5}{12}$	$7\frac{4}{7}$ $3\frac{1}{7}$	$4\frac{1}{3}$ $3\frac{7}{15}$	$3\frac{4}{6}$ $2\frac{5}{6}$	$9\frac{1}{4}$ $3\frac{4}{12}$	16 $1\frac{1}{2}$

Subtract:

5.	$6\frac{1}{4}$ $2\frac{1}{4}$	$5\frac{2}{3}$ $1\frac{1}{3}$	6 $2\frac{1}{3}$	$7\frac{1}{5}$ $3\frac{4}{5}$	$7\frac{1}{4}$ $1\frac{7}{12}$	$6\frac{1}{2}$ 1
6.	7 $4\frac{1}{2}$	$10\frac{2}{3}$ $5\frac{8}{9}$	$14\frac{3}{4}$ $6\frac{3}{8}$	$4\frac{1}{2}$ $1\frac{1}{4}$	$8\frac{2}{3}$ 5	$3\frac{1}{3}$ 3

Change to improper fractions:

7.	$2\frac{1}{2}$	$3\frac{2}{3}$	$6\frac{1}{4}$	$8\frac{5}{6}$	$4\frac{1}{12}$	$3\frac{3}{4}$
8.	$2\frac{5}{8}$	$2\frac{2}{9}$	$3\frac{1}{3}$	$4\frac{2}{7}$	$5\frac{1}{7}$	$1\frac{5}{6}$

Change to wholes or mixed numbers:

9.	$\frac{12}{3}$	$\frac{16}{2}$	$\frac{8}{4}$	$\frac{9}{7}$	$\frac{7}{6}$	$\frac{12}{5}$
10.	$\frac{9}{8}$	$\frac{7}{3}$	$\frac{3}{2}$	$\frac{7}{5}$	$\frac{14}{3}$	$\frac{16}{6}$

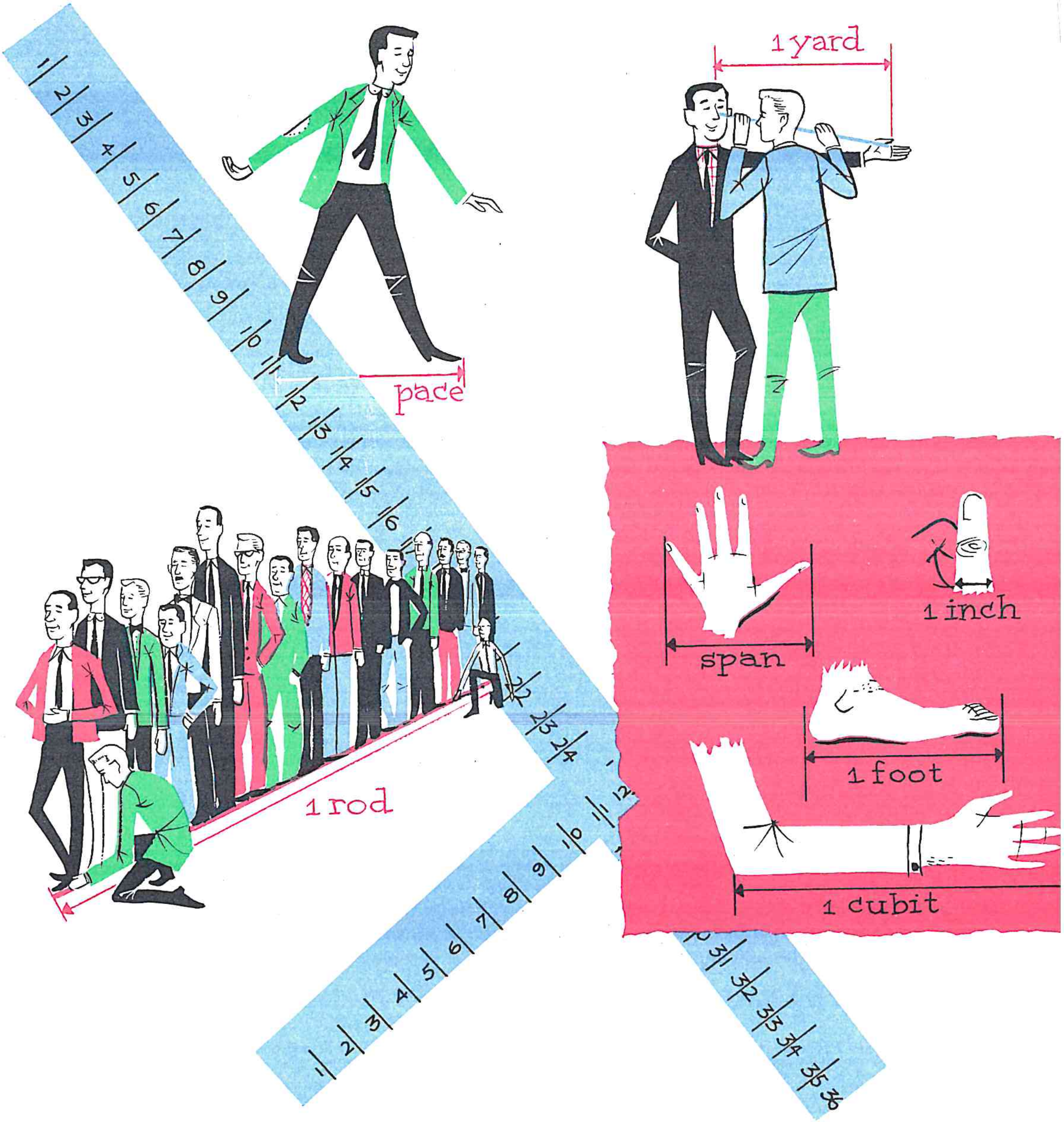
11. Change these to mixed numbers:

a. 7 quarters 9 pints 11 dimes 22 nickels
b. 9 quarts 5 cups (to qt.) 15 inches

12. Helen bought $2\frac{1}{2}$ yd. of lace at 30¢ a yd. How much did she pay for it?

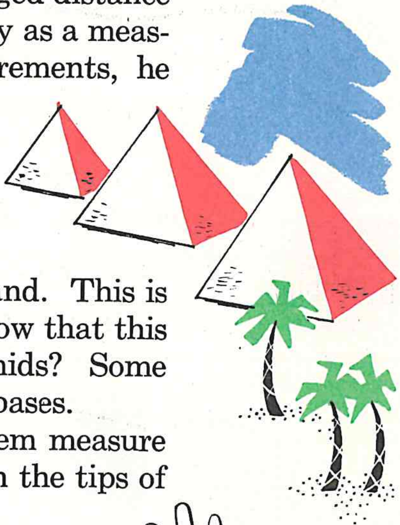
UNIT 9

Our Ways of Measuring Things

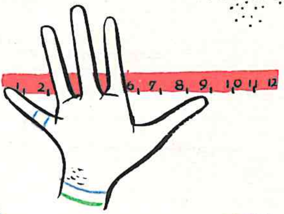


If you ask your little brother or sister or some other little child how tall something is, he may say, "It is as tall as my Daddy." If you ask him how large something is, he may tell you it is as large "as my house."

It was the same with the cave man. He judged distance by what he saw around him. He used his body as a measuring aid. When he needed smaller measurements, he used parts of his body, like his hands or his feet.



The *cubit* was a measurement used for many years. It was the bent forearm from the tip of the elbow to the tip of the middle finger of the outstretched hand. This is usually a distance of 18 to 19 in. Did you know that this measurement was used in building the pyramids? Some pyramids measure 2,000 cubits around their bases.



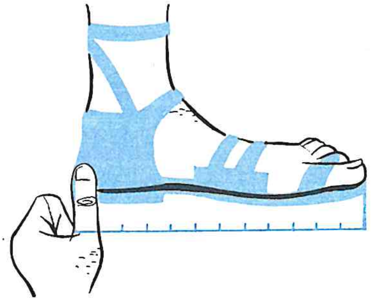
The Egyptians used their hands to help them measure things. The *span*, which is the length between the tips of the thumb and the little finger of the outstretched hand, was often used. This is about 9 in. or $\frac{1}{2}$ cubit. Measure your hand to see what your span is.

The height of horses is still measured by *hands*. You often hear someone say, "That horse stands 16 hands high."

One hand equals about 4 in., so what is the height of the horse in feet and inches?

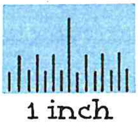
The Egyptians also used their palm. The *palm* usually measures 3 in. Is this what your palm measures?

Later, people began to use their feet as measuring instruments. The *foot* was considered to be about 1 ft. long. People still use their feet when they wish to measure short distances roughly, or the *pace* when they measure longer distances.



The Inch, the Foot, and the Yard

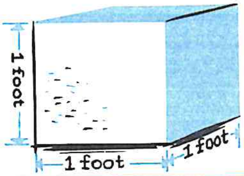
Did you ever wonder who invented the **inch**? It was the Romans. It was equal to the width of the thumb. A human foot was equal to about 12 of these parts, so our **foot** ruler was made with 12 of these equal parts called inches.

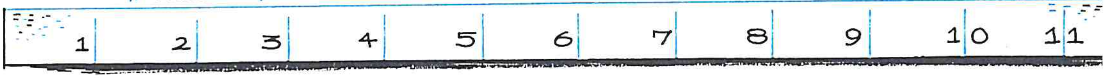


An inch is made up of parts. Can you find the parts of an inch shown here?

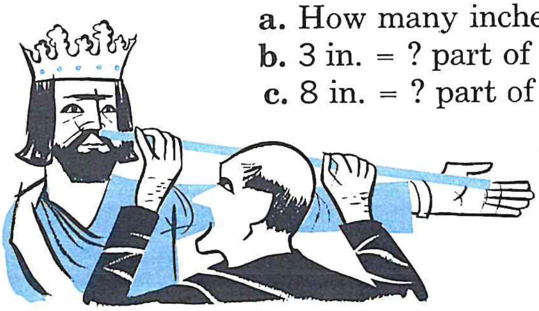
$\frac{1}{2}$ in. = $\frac{?}{4}$ in. $\frac{1}{2}$ in. = $\frac{?}{16}$ in. $\frac{1}{4}$ in. = $\frac{?}{8}$ in. $\frac{2}{8}$ in. = $\frac{?}{4}$ in.

There is a legend that the foot became a measure because it was the length of King Alfred's foot. It may have been more likely that King Alfred established the foot as a measure of the side of a vessel holding 1000 Roman ounces of water.

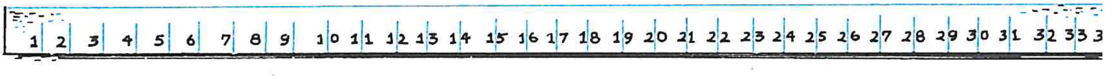




a. How many inches are there in $\frac{1}{2}$ ft.?
b. 3 in. = ? part of a foot? (How many 3's in 12?)
c. 8 in. = ? part of a foot? (Find how many 4's in 12.)



The **yard** is said to have been established by King Henry I. It was the distance from the tip of his nose to the end of his thumb.



a. $\frac{1}{2}$ yd. = ? in. **b.** $\frac{1}{4}$ yd. = ? in.
c. There are ? groups of 12 in. in a yard or ? ft. in 1 yd.

Practice with Inches, Feet, and Yards

Add:

1. $$\begin{array}{rrr} 1\text{ yd.} & +\ 1\text{ ft.} & +\ 3\text{ in.} \\ 1\text{ yd.} & +\ 1\text{ ft.} & +\ 8\text{ in.} \\ \hline \end{array}$$

2. $$\begin{array}{rrr} 2\text{ yd.} & +\ 2\text{ ft.} & +\ 1\text{ in.} \\ 1\text{ yd.} & & +\ 8\text{ in.} \\ \hline \end{array}$$

3. $$\begin{array}{rrr} 1\text{ yd.} & & +\ 4\text{ in.} \\ & 2\text{ ft.} & +\ 3\text{ in.} \\ \hline \end{array}$$

4. $$\begin{array}{rrr} 3\text{ yd.} & +\ 1\text{ ft.} & +\ 5\text{ in.} \\ 2\text{ yd.} & +\ 1\text{ ft.} & +\ 5\text{ in.} \\ \hline \end{array}$$

$$\begin{array}{rrr} 1\text{ yd.} & +\ 1\text{ ft.} & +\ 4\text{ in.} \\ 1\text{ yd.} & +\ 1\text{ ft.} & +\ 9\text{ in.} \\ \hline 2\text{ yd.} & +\ 2\text{ ft.} & +\ 13\text{ in.} \\ 3\text{ yd.} & & +\ 1\text{ in.} \end{array}$$

13 in. = 1 ft. and 1 in.
2 ft. + 1 ft. (held from 13 in.)
= 3 ft. or 1 yd.
Explain the rest of the work.

5. $$\begin{array}{rrr} 2\text{ yd.} & +\ 3\text{ ft.} & +\ 9\text{ in.} \\ 2\text{ yd.} & +\ 4\text{ ft.} & +\ 8\text{ in.} \\ \hline \end{array}$$

6. $$\begin{array}{rrr} 3\text{ yd.} & +\ 1\text{ ft.} & +\ 8\text{ in.} \\ 1\text{ yd.} & +\ 3\text{ ft.} & +\ 7\text{ in.} \\ \hline \end{array}$$

7. $$\begin{array}{rrr} 1\text{ yd.} & +\ 1\text{ ft.} & +\ 7\text{ in.} \\ 5\text{ yd.} & +\ 1\text{ ft.} & +\ 6\text{ in.} \\ \hline \end{array}$$

8. $$\begin{array}{rrr} 3\text{ yd.} & +\ 2\text{ ft.} & +\ 5\text{ in.} \\ 3\text{ yd.} & & +\ 7\text{ in.} \\ \hline \end{array}$$

Subtract:

9. $$\begin{array}{rrr} 6\text{ yd.} & +\ 2\text{ ft.} & +\ 8\text{ in.} \\ -\ 2\text{ yd.} & +\ 2\text{ ft.} & +\ 2\text{ in.} \\ \hline \end{array}$$

10. $$\begin{array}{rrr} 2\text{ yd.} & +\ 1\text{ ft.} & +\ 9\text{ in.} \\ -\ 1\text{ yd.} & +\ 1\text{ ft.} & +\ 3\text{ in.} \\ \hline \end{array}$$

$$\begin{array}{rrr} 5\text{ yd.} & +\ 2\text{ ft.} & +\ 2\text{ in.} \\ -\ 1\text{ yd.} & +\ 1\text{ ft.} & +\ 8\text{ in.} \\ \hline 4\text{ yd.} & & +\ 6\text{ in.} \end{array}$$

Use 1 ft. to give you more inches.
12 in. + 2 in. = 14 in.
Explain the rest of the work.

11. $$\begin{array}{rrr} 4\text{ yd.} & +\ 3\text{ ft.} & +\ 5\text{ in.} \\ -\ 1\text{ yd.} & +\ 1\text{ ft.} & +\ 7\text{ in.} \\ \hline \end{array}$$

12. $$\begin{array}{rrr} 2\text{ yd.} & +\ 2\text{ ft.} & +\ 4\text{ in.} \\ -\ 1\text{ yd.} & +\ 1\text{ ft.} & +\ 8\text{ in.} \\ \hline \end{array}$$

13. $$\begin{array}{rrr} 7\text{ yd.} & +\ 2\text{ ft.} & \\ -\ 2\text{ yd.} & & +\ 9\text{ in.} \\ \hline \end{array}$$

14. $$\begin{array}{rr} 8\text{ yd.} & +\ 7\text{ in.} \\ -\ 1\text{ yd.} & +\ 9\text{ in.} \\ \hline \end{array}$$

Multiply:

15. $$\begin{array}{r} 1\text{ yd.} +\ 1\text{ ft.} +\ 3\text{ in.} \\ \times\ 3 \\ \hline \end{array}$$

16. $$\begin{array}{r} 2\text{ yd.} +\ 1\text{ ft.} +\ 7\text{ in.} \\ \times\ 2 \\ \hline \end{array}$$

Divide:

17. $2\overline{)8\text{ yd.} + 4\text{ ft.} + 8\text{ in.}}$

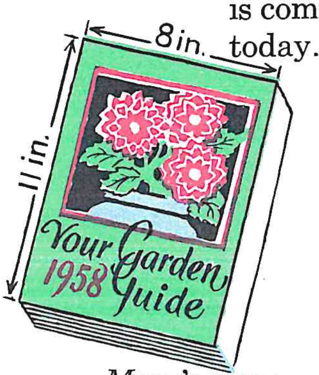
18. $3\overline{)3\text{ yd.} + 2\text{ ft.} + 9\text{ in.}}$

Spring Is Coming

Jim lives in the country. He knows that spring is coming. He saw two violets blooming by an old log near the lake, and he says that is always a good sign of spring.

Ann lives in the city. She knows that spring is coming too, because she saw a robin in the park.

Bill and Mary live in a small town. They know spring is coming because the mailman brought the seed catalogue today.


8 in.
11 in.
Your Garden 1958 Guide

"Oh, boy! Look at the size of this seed catalogue!" said Bill, when he brought it into the house.

Mary said, "It's the biggest one we ever got. Let's measure it to see how large it is."

Then Bill and Mary found how many inches it was around the edge of the seed catalogue.

Mary's way:

$$\begin{array}{r} 11\text{ in.} \\ 8\text{ in.} \\ 11\text{ in.} \\ +\ 8\text{ in.} \\ \hline 38\text{ in.} \end{array}$$

Mary found the answer by adding the number of inches on each side. Why would she need to add these measurements?

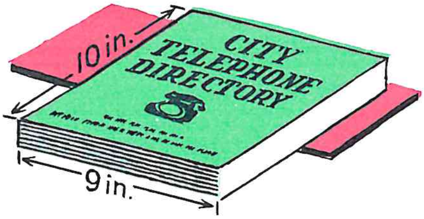
Bill's way:

$$\begin{array}{r} 11\text{ in.} \\ \times\ 2 \\ \hline 22\text{ in.} \end{array} \qquad \begin{array}{r} 8\text{ in.} \\ \times\ 2 \\ \hline 16\text{ in.} \end{array} \qquad \begin{array}{r} 22\text{ in.} \\ +\ 16\text{ in.} \\ \hline 38\text{ in.} \end{array}$$

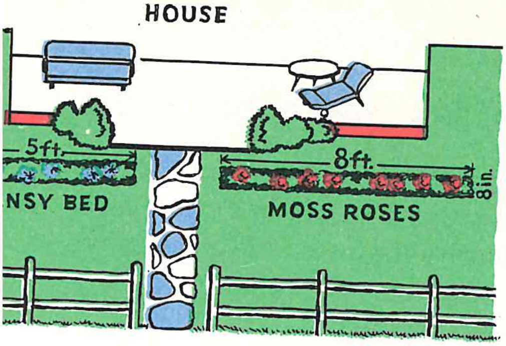
Bill found the answer by multiplying the length by 2 and the width by 2, and adding the results. Why is his work correct?

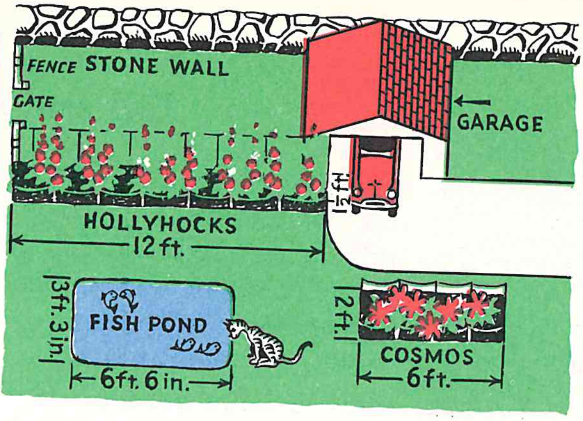
Then Bill and Mary figured out another way they could find the distance around the catalogue:

$$\begin{array}{rl} 11\text{ in.} & \text{(length)} \\ +\ 8\text{ in.} & \text{(width)} \\ \hline 19\text{ in.} & \end{array} \qquad \begin{array}{r} 19\text{ in.} \\ \times\ 2 \\ \hline 38\text{ in.} \end{array}$$


10 in.
CITY TELEPHONE DIRECTORY
9 in.

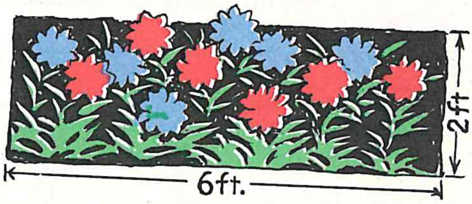
Mary wanted to know if the seed catalogue is larger than the phone book. Is it larger or smaller? Why?


HOUSE
5 ft.
NSY BED
8 ft.
8 in.
MOSS ROSES



Planning a Lawn

This is a picture of the front and back lawns of the Johnson home. Bill and Mary are helping decide what flowers to plant and where to plant them.



1. Mary has planted cosmos here. How long must a piece of cord be to go around the flower bed?

2. Bill has planted hollyhocks from the garage to the fence. He used space that was $1\frac{1}{2}$ ft. in width and 12 ft. in length. How much cord will he need for the 2 ends and one side of his hollyhock bed?

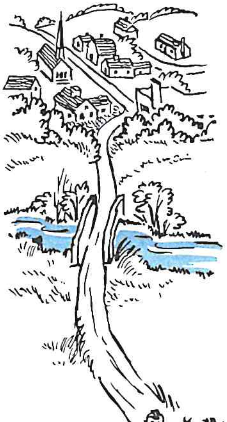
3. The Johnsons made a fish pond in the back yard. Their cat, Nellie, sits by the fish pond switching her tail and looking greedily into the water. They decided to put an 8-inch fence around it. How much wire must they buy to go around the fish pond which is 6 ft. 6 in. long and 3 ft. 3 in. wide? (Change 6 ft. 6 in. to $6\frac{1}{2}$ ft.; 3 ft. 3 in. to $3\frac{?}{4}$ ft.)

4. Find the distance around the pansy bed Mary planted in front of the house.

5. Nellie will not stay off the bed that they made for the moss roses. How much fence will Bill need to go around this piece of ground?

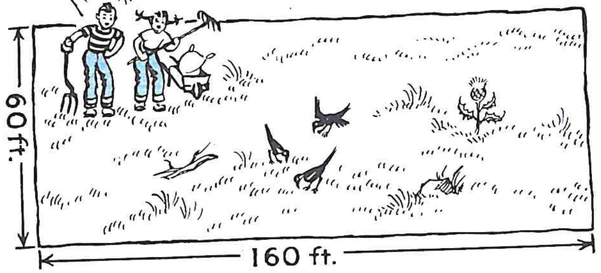
> The total distance around anything is called its **perimeter**.

Bill and Mary Make Big Plans



The more Bill thought about all the seeds you could get for two dollars, the more he wanted to plant all the vegetables he liked and his favorite flowers. The more he thought about vegetables, the more he thought about raising some to sell and to give to friends.

Bill told Mary about it. She thought it would be fun to plant a large garden. Bill's father said he would rent a piece of ground for them from Mr. Walters. They would have to raise all the vegetables the family could eat, and they could do as they wished with the rest.



Bill and Mary went out to look at the ground their father had rented for them. They decided they would first put a fence around it.

1. Find the perimeter of their garden plot.

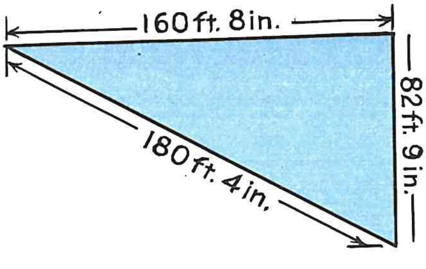
2. They can get a roll of wire 2 ft. high which will cost $21.60 for a 150-foot roll. Will this be enough to go around their garden plot?

3. They can buy this same kind of wire for 16¢ per foot. How much will it cost if they buy it by the foot?

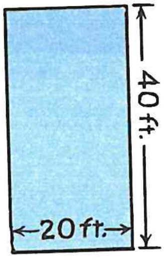
Which would be the best way for them to buy: by the roll or by the foot?

Find the perimeters of these garden plots:

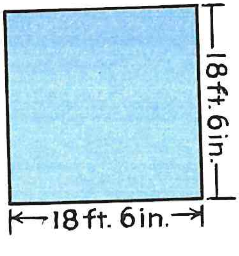
4.



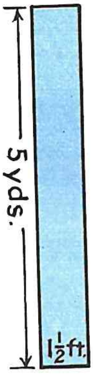
5.



6.



7.

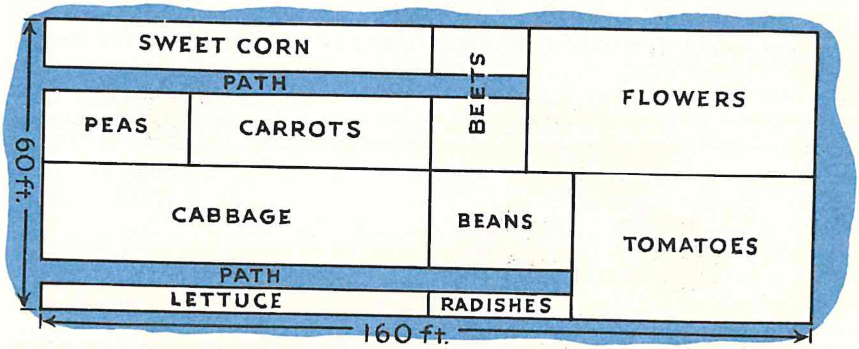


Planning the Garden

Bill and Mary have decided to draw a plan of where they will plant everything in their garden.

Mary said, "How can we draw a plan? We do not have a piece of paper 160 ft. long and 60 ft. wide."

Bill said, "We will have to make everything smaller. I studied how to do scale drawings in school. We can make our drawing so that 1 in. stands for 40 ft. We write it, 1 in. = 40 ft. Then we will have room on paper to show the garden plot and all of its parts."



1. Use your ruler to find how long the lettuce rows are (a) on the drawing, (b) in the garden.

2. How wide will the tomato bed be? How long?

3. Find the width of the bean bed. The rows are going to be 15 in. apart. How many rows can they plant?

4. Cabbage plants have to be in rows 30 in. apart. How many rows can be planted in the cabbage bed?

5. Which is longer, the pea bed or the carrot bed? How much longer?

6. Find the perimeter of the carrot bed.

7. How long can the rows of sweet corn be? What is the perimeter of the sweet corn bed?

8. Find the perimeter of the flower beds.

9. Measure the length and width of the drawing above to be sure the scale drawing is correct.

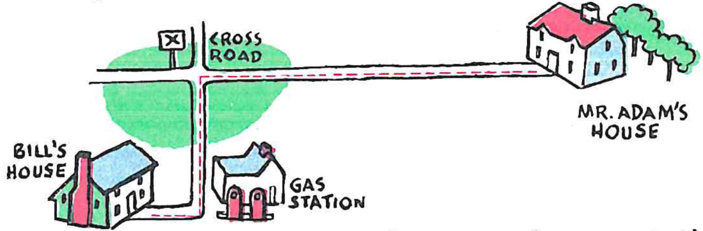
Going for Tomato Plants

Mr. Adams said Bill and Mary could have all the tomato plants they wanted if they would come out to his place to get them.

Mr. Adams lives on two acres of land $1\frac{1}{2}$ miles from town. He plants tomato seeds in March, and they are 3 in. high when it is time to plant them in the gardens.

Bill wasn't sure just how to get to Mr. Adams' place. His mother told him how to get there; so Bill made a map, using 1 in. = 1 mile.

This is the map he showed his mother. She said it was good enough for him to find his way to Mr. Adams' house.



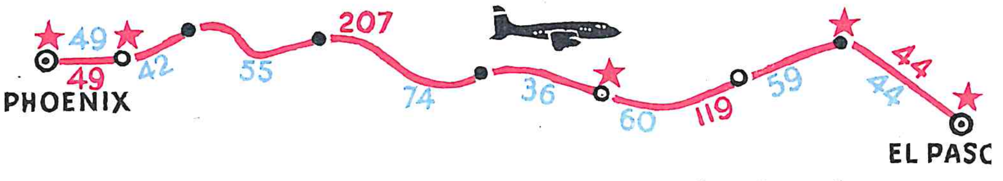
1. How far is it from Bill's home to the gas station?

2. Find the distance from the gas station to the crossroads.

3. How far does Mr. Adams live from the crossroads?

4. Write out the directions from Bill's home to where Mr. Adams lives.

5. In the map below, you are given 2 sets of figures to help you find out how far it is from Phoenix, Arizona to El Paso, Texas.

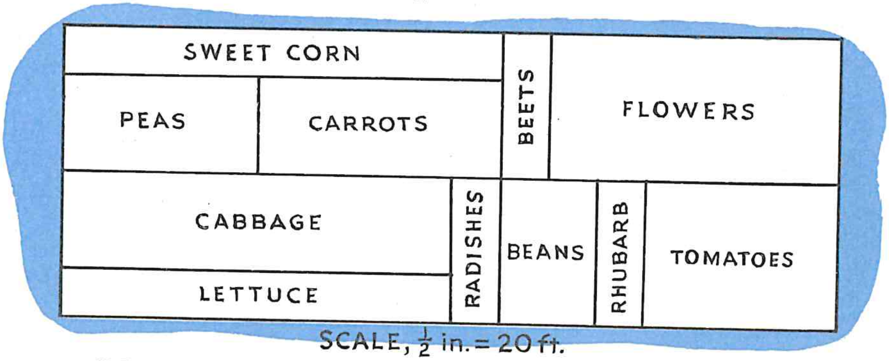


Use one set of figures (in red) and check by the other set (in blue) to find the distance between Phoenix, Arizona and El Paso, Texas.

Mr. Adams Helps Bill with His Garden Plans

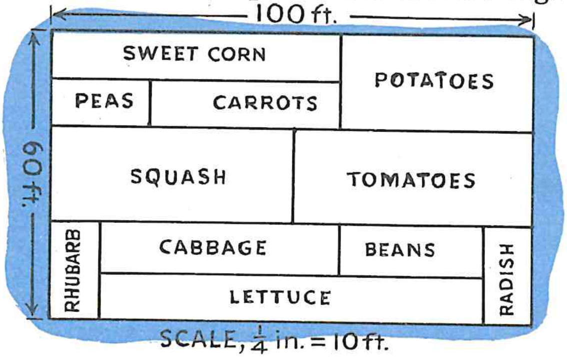
Bill showed Mr. Adams the scale drawing for his garden.

1. Look at the map below to see how Mr. Adams has suggested that Bill plot his garden. Find the perimeters of each bed in the garden plot.



SCALE, $\frac{1}{2}$ in. = 20 ft.

2. Mr. Adams drew a quick plot of part of his own garden to show Bill. Find the perimeter of each vegetable bed.

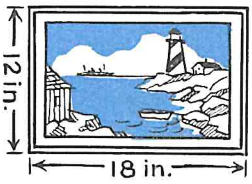


SCALE, $\frac{1}{4}$ in. = 10 ft.

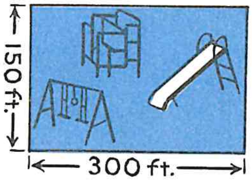
3. Draw a map showing the distance from your school to some place in your community. Use any scale you wish.

4. Find the perimeters of these:

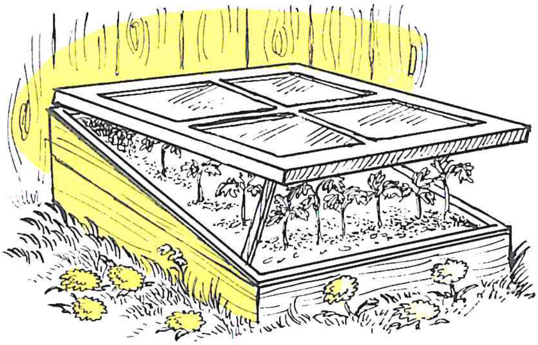
a.



b.


150 ft.
300 ft.

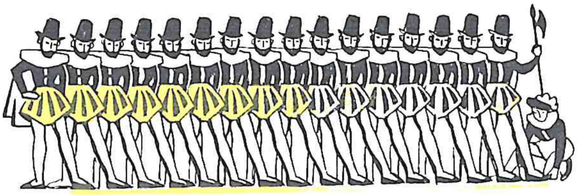
Practice with Scale Drawings and Finding Perimeters



The Rod and the Mile

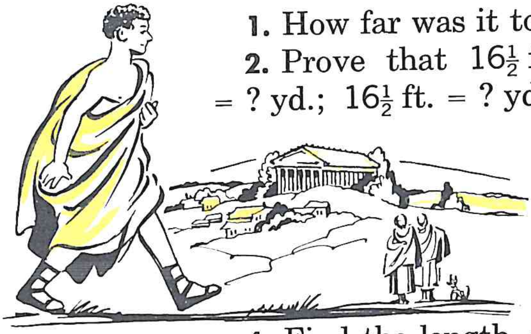
Mr. Adams and Bill went to the hot house to get the tomato plants.

Mr. Adams said, "It is 12 **rods** to the hot house."



Bill didn't know about the measurement called a rod. When he got home, he looked in a book to find what it meant. This is what he found: The rod was established in the 16th century. It was the total measurement of the left feet of 16 men.

1 rod = $16\frac{1}{2}$ ft. or $5\frac{1}{2}$ yd.



1. How far was it to the hot house? 12 rods = ? ft.

2. Prove that $16\frac{1}{2}$ ft. = $5\frac{1}{2}$ yd. (15 ft. = ? yd.; $1\frac{1}{2}$ ft. = ? yd.; $16\frac{1}{2}$ ft. = ? yd.)

3. How many feet are there in 4 rods?

Bill found that a **mile** was established as 1,000 paces or double steps. (1 mile = 5,280 ft.)

4. Find the length, in feet, of 3 rd.; of 6 rd.; of 20 rd.

5. Add:

a.
3 yd. 1 ft. 1 in.
+ 1 ft. 8 in.

b.
3 rd. 1 yd. 3 ft.
+ 1 rd. 1 yd. 2 ft.

6. Subtract:

a.
3 yd. 2 ft. 9 in.
− 1 yd. 1 ft. 7 in.

b.
6 rd. 2 yd. 9 in.
− 1 rd. 2 yd. 5 in.

c.
4 rd. 1 yd. 2 in.
− 1 rd. 2 yd.

7. Find the answers to these:

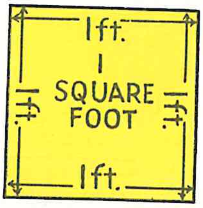
a. $\frac{1}{2}$ mi. = ? ft. **b.** 40 rd. = ? ft. = ? yd.

Using Fertilizer for a Better Garden

Bill and Mary are going to put fertilizer on the soil in their garden. The directions say to use 4 pounds for 100 square feet.

Bill and Mary do not know how many square feet there are in their garden. They do not even know what a square foot is.

Their mother said she would show them. She used a foot ruler to draw a square which was *1 foot on each of the 4 sides.*

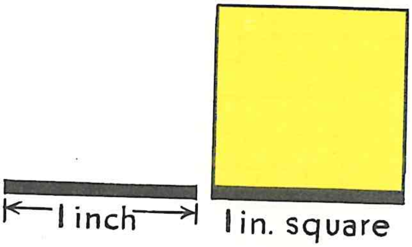


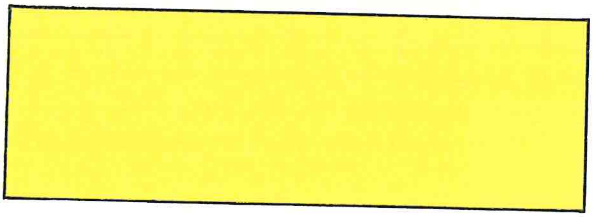
Mother said, "This is 1 **square foot** (sq. ft.). The surface of this is called its **area.**"

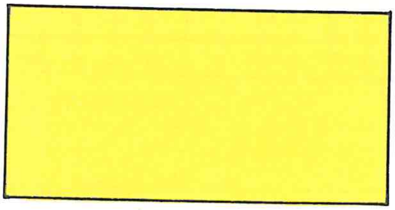
Bill drew a **square inch.** Why is this a square inch (sq. in.)? Move your finger over the surface of it. What is the difference between 1 in. and 1 sq. in.?

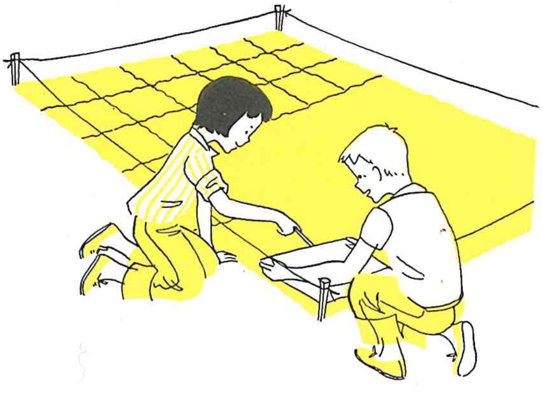
Cut a square inch out of paper.

Look at these drawings to see how many square inches there are in each.









Bill and Mary cut a square foot from a piece of cardboard. They measured to see how many square feet there were in their garden space for flowers. They had to draw lines with a stick. How many square feet do they have so far?

Meaning of Area

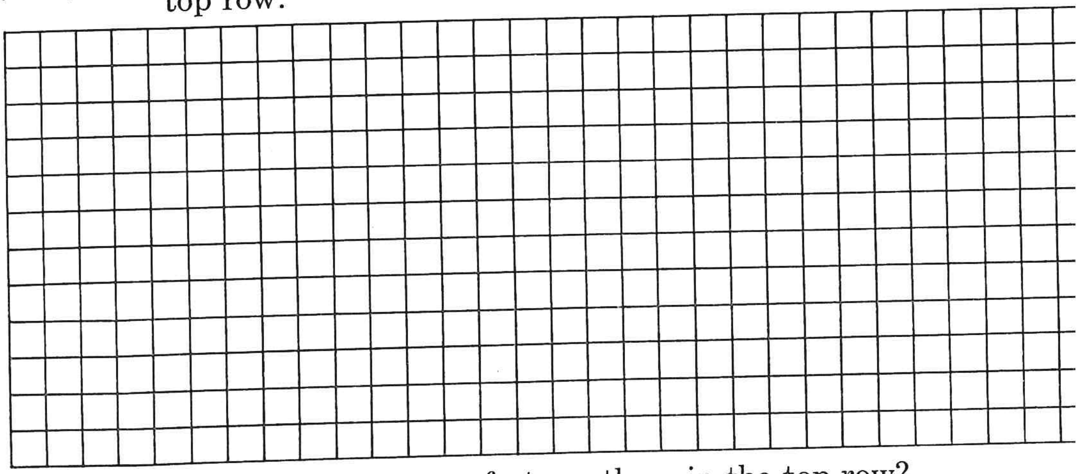
Finding the Area

Bill and Mary worked and worked. They worked on their knees, finding part of the area for flowers, until their knees hurt.

At last they were finished.

"There are so many square feet that it will take a long time just to count them," Mary said.

Help Bill and Mary count the square feet in their garden. Let's begin by counting the square feet in the top row:



How many square feet are there in the top row?

How many square feet are there in the second row? in the third row?

Are there the same number of square feet in each row?

How many rows are there?

Bill and Mary counted the square feet in the first 5 rows at the top of the garden. Then they sat down to rest their tired knees and backs.

Suddenly Bill shouted so loud that Mary jumped. "I know an easy way to find how many square feet there are in our garden!" Can you think of it? If not, you will have to count the rest of the square feet to find how many there are.

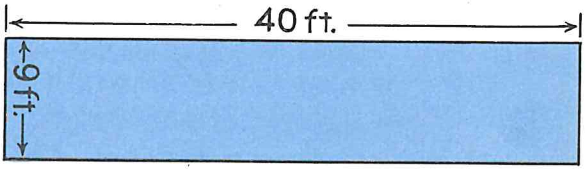
The Long Way to Find Area—Counting

More Fertilizer for the Tomato Bed

Mr. Adams told Bill that tomatoes should have more fertilizer than the average vegetable. Bill and Mary got a rich fertilizer. The directions said to put 2 pounds on each 100 square feet.

The tomato bed is 40 feet long and 9 feet wide. They need to know how many square feet there are in the tomato bed before they will know how much fertilizer to use.

"This time I am not going to wear out my knees and back," Bill said. "I am going to use the shorter way that I discovered."



This is the way he figured:

There are 40 square feet in the first row. There are 9 rows. So, 40 square feet in each row, and 9 rows, tells me that 9 × 40 sq. ft. is the area.

$$\begin{array}{r} 40 \text{ square feet} \\ \underline{\times\ 9\phantom{\text{ square feet}}} \\ 360 \text{ square feet} \end{array}$$

Mary figured it this way:

$$\begin{array}{r} 40 \text{ sq. ft.} \\ \underline{+\ 40 \text{ sq. ft.}} \\ 80 \text{ sq. ft.} \\ \underline{+\ 40 \text{ sq. ft.}} \end{array}$$

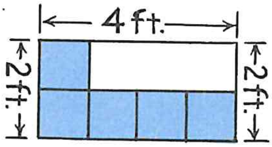
and so on.

Did Mary get the same answer as Bill? Which way is shorter?

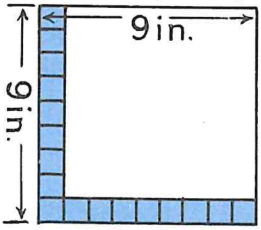
1. Check the shorter way by drawing a rectangle 10 in. long and 3 in. wide. Divide this into squares $\frac{1}{4}$ in. on a side. Count the number of squares.

Find the area of these figures:

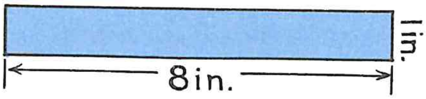
2.



3.



4.



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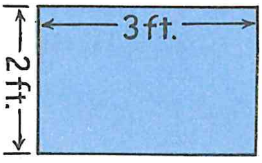
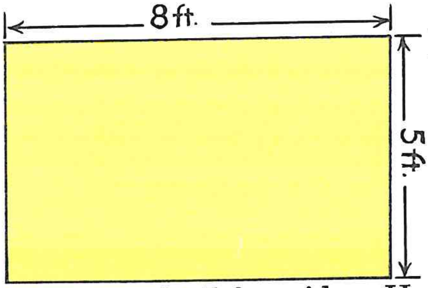




Practice in Finding Area

Look at this figure. How many square feet are there along the top row? Do you see that there are as many sq. ft. as there are feet in the length?

It is 5 ft. wide. How many sq. ft. would be found along 1 side of the width?

There are 8 sq. ft. in the top row, and there are 5 rows, so 5 × 8 sq. ft. = ? sq. ft.

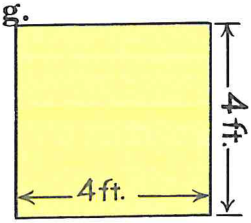
Does multiplying the number of feet in length by the number of feet in width give the number of square feet in the area of a rectangle?

1. Draw a rectangle 7 in. long and 4 in. wide. Use the scale 1 in. = 1 ft. Find the number of square feet in an area this size by drawing the squares and counting them.

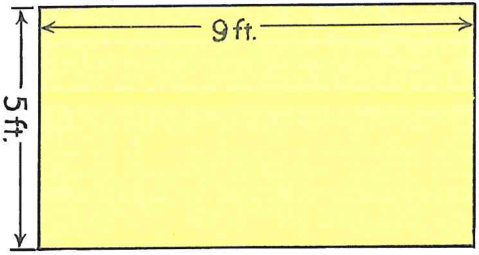
2. Find the areas of these:

a. 4 ft. × 3 ft.
b. 6 in. × 3 in.
c. 16 ft. × 5 ft.
d. 13 ft. × 9 ft.
e. 17 yd. × 2 yd.
f. 8 rd. × 6 rd.

g.



h.



3. Find the answers to these:

a. 1 rd. = ? ft.
b. ? ft. = 1 mile
c. ? yd. = 1 rd.
d. ? ft. = 1 yd.
e. 9 ft. = ? yd.
f. 8 rd. = ? yd.

4. Which is greater in area:

a. a rectangle 8 ft. × 6 ft. or a rectangle 5 ft. × 9 ft.?
b. a rectangle 12 ft. × 7 ft. or a rectangle 9 ft. × 8 ft.?
c. an 8 ft. square or a rectangle 7 ft. × 9 ft.?

Spring House Cleaning

Mary and Bill had planted all their seeds. Now they had to wait awhile until they started to come up. Mother said this would be a good time to do the spring housecleaning.

1. Bill was asked to measure a small table and go to a glass shop to get a piece of glass to cover it. Bill found the table to be $3\frac{1}{2}$ ft. by 2 ft. Glass is sold by the square foot. How many square feet must Bill buy?

2. Glass is 69¢ per square foot. How much will Bill have to pay for the glass to cover the table top?

3. Mary is cleaning a rug. It takes 1 teaspoon of liquid cleaner for each square foot of the rug. The rug is 9 ft. × 12 ft. How many teaspoons of cleaner should Mary use?

4. Bill and his father are going to buy a new plywood top for the table-tennis table. The kind of plywood that is best for the table top costs 20¢ a square foot. Find the cost of a piece 4 ft. × 10 ft.

5. Mother wants Mary to measure the entrance hall to find how large a rug is needed to cover it from wall to wall. Mary found the hall to be 11 ft. × 4 ft. How many square feet are there in the area of the entrance hall?

6. Mary is going to cover the desk in her room with a large blotter. The top of the desk is 26 in. × 18 in. Find its area in square inches.

7. Bill is helping his father put new window screening on one of the windows. What will the screen cost for a window that measures 6 ft. × 4 ft. if the price per square foot of screening is 8¢?

8. Find the area:

a. $6\frac{2}{3}$ ft. × 3 ft.
b. 6 mi. × 4 mi.
c. $17\frac{1}{2}$ rd. × 16 rd.
d. $9\frac{1}{2}$ ft. × 8 ft.

Practice in Finding Area

New Linoleum for the Kitchen

Everyone in the family helped to measure the kitchen floor for linoleum. They found it to be 12 ft. × 15 ft.

Then they all went downtown to pick out the pattern of linoleum they liked best. The pattern they chose is sold only by the **square yard**.

Bill and Mary were sad until their mother and father said they would be able to find out how many square yards there were in the kitchen.

Mother's work:

$$\begin{array}{r} 12 \\ \times\ 15 \\ \hline 60 \\ 12 \\ \hline 180 \text{ sq. ft.} \end{array}$$

There are 9 sq. ft. in 1 yd., so I will divide the number of square feet by 9. (Why are there 9 sq. ft. in 1 sq. yd.?)

$$\begin{array}{r} 20 \text{ sq. yd.} \\ 9\overline{)180} \\ \underline{18} \\ 0 \\ \underline{0} \end{array}$$

Father's work:

I will change the feet to yards before I multiply. Then I will have the number of yards for both the length and the width and can multiply to find square yards.

$$\begin{array}{r} 4 \text{ yd.} \\ 3 \text{ ft.}\overline{)12 \text{ ft.}} \\ \underline{12}\phantom{\text{ ft.}} \end{array} \qquad \begin{array}{r} 5 \text{ yd.} \\ 3 \text{ ft.}\overline{)15 \text{ ft.}} \\ \underline{15}\phantom{\text{ ft.}} \end{array}$$

$$\begin{array}{r} 5 \\ \times\ 4 \\ \hline 20 \text{ sq. yds.} \end{array}$$

Did they get the same number of square yards?

1. Find the area in square yards by first multiplying the number of feet in the length by the number of feet in the width, and then dividing by 9:

a. 18 ft. × 20 ft. **b.** 9 ft. × 12 ft. **c.** 6 ft. × 9 ft.

2. Find the area in square yards by first changing feet to yards for both the length and width:

a. 18 ft. × 27 ft. **b.** 9 ft. × 15 ft.
c. 6 ft. × 12 ft. **d.** 15 ft. × 21 ft.

144 sq. in. = 1 sq. ft.	9 sq. ft. = 1 sq. yd.

Getting Ready for Spring

1. Bill helped his father build a new concrete sidewalk. The walk measured 1 yd. in width and 108 ft. in length. How many square yards did the sidewalk cover?

2. Their next job was to put a new concrete floor in the garage. It is 21 ft. long and 12 ft. wide. What is its area in square yards?

3. Mary and her mother measured the floor in the playroom. The floor measured 15 ft. × 9 ft. At $2.18 a square yard, how much would the linoleum for the playroom cost?

4. Mrs. Johnson is thinking about getting a new rug for the living room. She and Mary measured the room and found that it was 19 ft. long by 13 ft. wide. Mrs. Johnson wants 6 in. of floor space to show around the entire edge of the room. Find the area of the rug in square feet.

5. Mary went to the store to buy a frame for a picture that is 14 in. by 19 in. What is the size of the picture in square inches?

6. One frame Mary saw was 2 ft. square. How much too large (in square inches) is this frame?

7. Find the area of an airport which is $2\frac{3}{4}$ mi. long and 1 mi. wide.

8. A pansy bed is $5\frac{1}{2}$ yd. long and 2 yd. wide. Find the area.

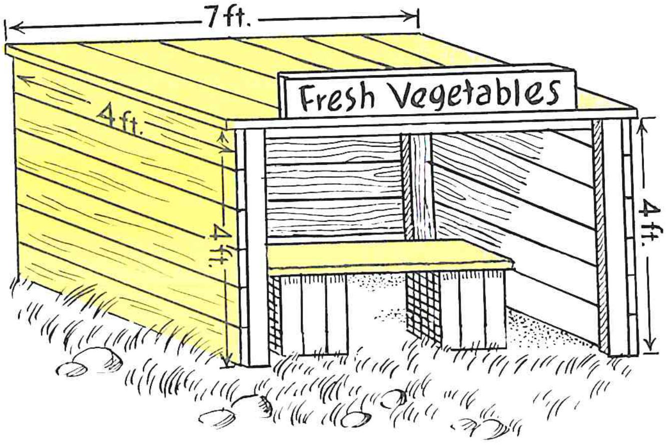
9. Find the area of a playground that is 12 rods long and 165 feet wide.

10. Find the number of square inches in 6 sq. ft.

11. How many square yards are there in 153 sq. ft.?

12. What is the area of a piece of copper that is 9 in. by 7 in.?

Problems in Area


7 ft.
4 ft.
4 ft.
4 ft.
Fresh Vegetables

Unit Review

1. This is a picture of the stand Bill and Mary have made. They are going to use it as a place where they can show the vegetables they have for sale.

a. Find the area of both ends of the stand.

b. Find the area of the back of the stand.

c. Find the area of the top of the stand.

d. How many square feet of wood are used in both ends, the back, and the top of the stand?

e. A quart of paint will cover an area of 100 square feet with 1 coat of paint. How much paint will be needed to paint the outside of the stand and the top with 1 coat?

2. Which of the following two gardens is the larger in perimeter? in area?

a. Henry's garden is 24 ft. long and 18 ft. wide.

b. Joe's is 28 ft. long and 16 ft. wide.

3. Marion had to cut the grass in the backyard. The space was 4 rods long and 54 feet wide. How many square feet of grass did Marion cut?

4. Draw a map of Marion's back yard, using the scale 1 in. = 6 ft.

5. Find the area of the top of your school desk.

6. Find the area of the largest book in your desk.

7. How could you prove that there are 144 square inches in 1 square foot?

8. Make a drawing to show that there are 9 square feet in 1 square yard.

Unit Test

1. Find the perimeter of these figures:

a. a rectangle, 15 feet long and 13 feet wide.

b. a square, 8 ft. on each side.

c. a triangle, 1 rd. long on two sides and 11 ft. on the third side.

d. a picture that is 3 ft. 8 in. long and 2 ft. wide.

2. Add:

$$\begin{array}{r} 1 \text{ rd. } 1 \text{ yd. } 1 \text{ ft.} \\ \underline{5 \text{ rd. } 1 \text{ yd. } 4 \text{ ft.}} \end{array}$$

3. Subtract:

$$\begin{array}{r} 2 \text{ yd. } 2 \text{ ft. } 6 \text{ in.} \\ \underline{1 \text{ yd. } 1 \text{ ft. } 9 \text{ in.}} \end{array}$$

4. Multiply:

$$\begin{array}{r} 12 \text{ ft. } 9 \text{ in.} \\ \underline{\times 3} \end{array}$$

5. Divide:

$$6\overline{)18 \text{ yd. } 6 \text{ ft. } 9 \text{ in.}}$$

6. Find the answers to these:

a. 1 rd. = ? ft.

b. 1 mile = ? feet.

c. ? sq. ft. = 1 sq. yd.

d. ? sq. in. = 1 sq. ft.

e. 24 ft. = ? yd.

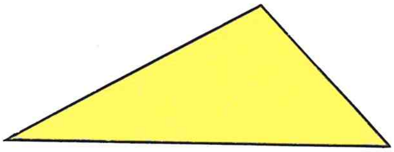
f. 1 rd. = ? yd.

7. Scale drawing:

a. Draw a line 24 in. long, using the scale 1 in. = 6 ft.

b. Use the scale 1 in. = 5 ft. to draw a rectangle 25 ft. long and 15 ft. wide.

c. Find the perimeter of this triangle. The scale used was $\frac{1}{2}$ in. = 4 ft.



8. Write the meaning of perimeter.

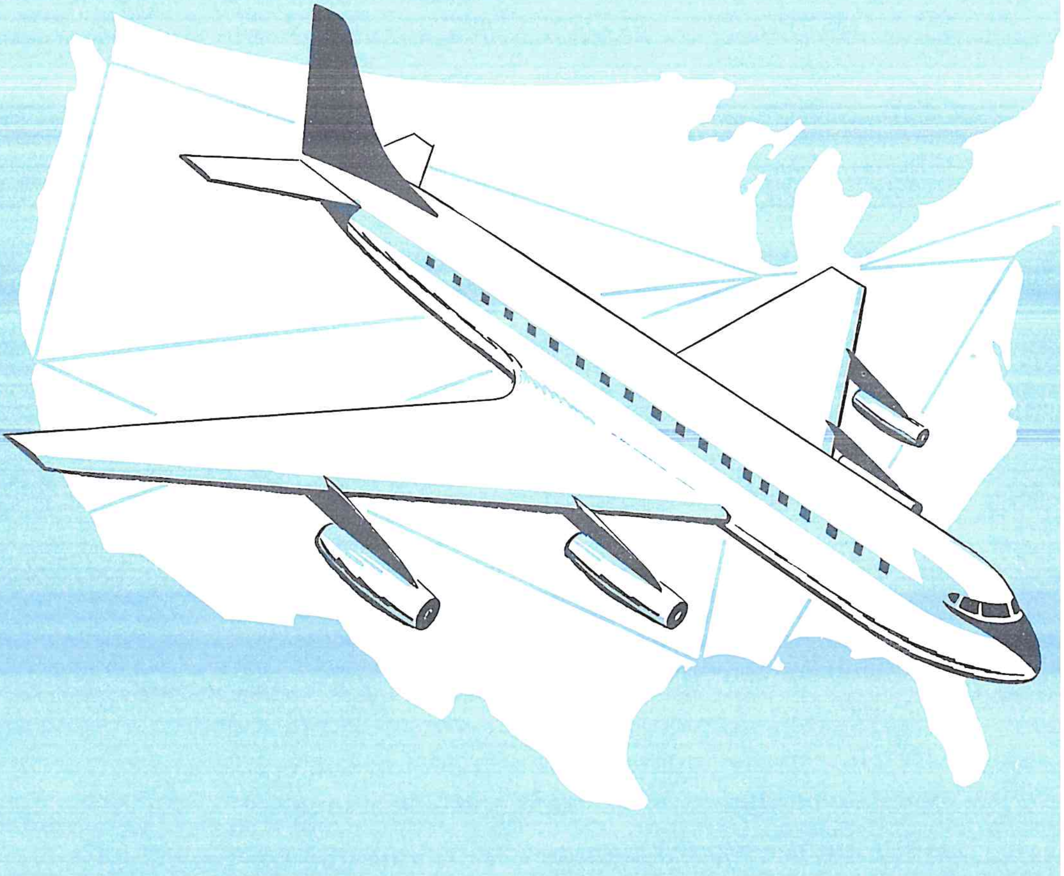
9. Tell in your own words how to find the area of any rectangle.

10. How many square yards of linoleum will you need to cover a floor that is 18 ft. wide and 24 ft. long?

11. Find the area of a garden 28 ft. long and 6 yd. wide.

UNIT 10

Travel in the Sky



Your grandfather may remember when Orville Wright flew his first airplane. The flight lasted 12 seconds, and the airplane traveled only 120 feet.

Your father remembers when Lindbergh was the first man to cross the Atlantic Ocean. Many people were afraid that Lindbergh could not fly that great a distance without stopping.

Can you remember the first jet plane? Do you remember that when you looked up, it was almost out of sight?

Look at the jet Stratoliner on the opposite page. It can carry up to 130 passengers at more than nine miles a minute! Jet planes can fly at 750 miles an hour and so high that the stars and moon are shining at noon far, far above the earth.

Did you ever walk a mile? How long did it take? If you walked 4 or 5 miles, you would begin to grow tired. Airplanes are a very good form of travel for long distances.

You will need to know about large numbers when you read about airplane travel. Do you have a good idea of how far 9 thousand miles is? Can you write that number?

Suppose you are planning a trip. How would you need arithmetic to figure the cost of your fare and the other expenses of the trip?

If you travel in a plane, you may have to set your watch ahead or back an hour or more if you go from one time zone to another. Do you know how many time zones there are in the United States and where you would change time?

Find a map right now, and figure out where you would go if you could go anywhere you wished. Where would it be? Use the map to find how far it would be.

Streaking Across the Sky

Jeff gave a long whistle. There in the newspaper in large black letters were the words,

JET SETS RECORD OF 3 HRS. 28 MIN. IN U.S. FLIGHT

"Wow! That's really getting there fast," Jeff said. Then Ben said, "It says right here that they flew a distance of 2,530 miles."

Do you know what these numbers mean?

2	5	3	0
thousands	hundreds	tens	ones

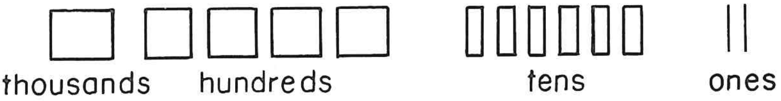
10 ones = 1 ten

10 tens = 1 hundred

10 hundreds = 1 thousand

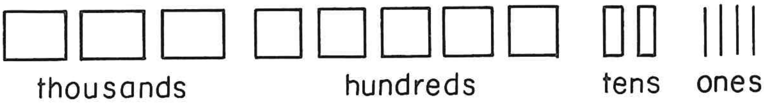
Study these pictures:

A.



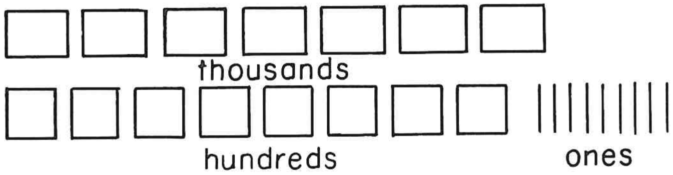
1	4	6	2
thousands	hundreds	tens	ones

B.



3	5	2	4
thousands	hundreds	tens	ones

C.



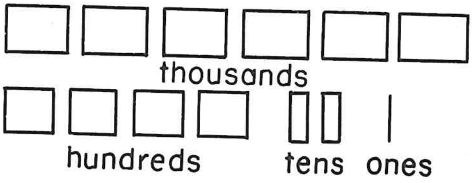
7	8	0	9
thousands	hundreds	tens	ones

Do you know how to read these figures? Read the first one (A) as one thousand four hundred sixty-two.

Reading and Writing Numbers in Thousands

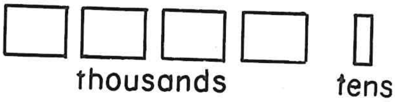
1. Write the amount shown in each of these pictures:

a.



thousands ? hundreds ? tens ? ones ?

b.



thousands ? hundreds ? tens ? ones ?

2. Look at the number 3,061. There are ? thousands, ? hundreds, ? tens, and ? one.

When you read this number, you say, "Three thousand sixty-one." (Do not say *and* between the parts.)

3. Read these numbers:

1,108 1,216 978 1,006 1,416 6,034 1,982

4. Write these numbers:

a. Two thousand four hundred eighty-one.

b. Three thousand six hundred seven.

5. Tell how this could be true:

thousands	hundreds	tens	ones
6	4	8	6

=

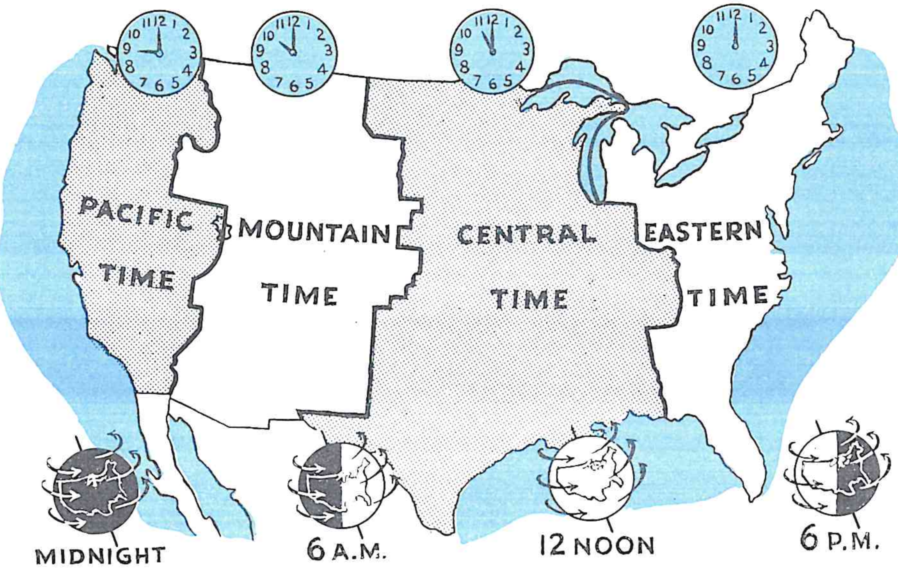
hundreds	ones
64	86

6. Tell why the following are true:

a. 8,567 = 85 hundreds, 6 tens, and 7 ones

b. 7,484 = 6 thousands, 12 hundreds, 24 tens, and 44 ones

7. If you were going to divide 3,025 by 55, could you use the 3 as thousands? the 30 as hundreds? the 302 as tens? Tell why.



Jeff Learns About Time Zones

Jeff read in the paper that the pilot of a jet plane had breakfast in New York at 7 A.M. and had another breakfast in San Francisco, California at 7:30 A.M. the same day.

"That couldn't be right," Jeff said to himself. "That must be a misprint in the newspaper."

Look at the picture above to see what you think. The sun rises in the east and sets in the west. Do you see that as the earth turns, the light from the sun shines on the eastern part of our country before it shines on the western part?

The earth turns gradually. Because of this, people could have hundreds of different sun times throughout the United States. Do you think that would be a good idea? Think of some ways it might lead to confusion.

See how the country is divided into **time zones** to allow for the difference in sun time from one ocean to the other. Everyone in a zone agrees to use the same time.

How many time zones are there in the United States? What are the names of the time zones?

Reading Time in the Zones

The clock faces in the picture on the opposite page show you how the time changes from one zone to the other.

1. When it is 8 A.M. Eastern Time in Philadelphia, what is the time in San Francisco, Pacific Time?

2. When the clocks read 7 A.M. Pacific Time in Los Angeles, California, what time is it in Chicago, Central Time?

3. As you travel westward from one zone to another, will you move your watch forward or backward 1 hour as you enter each time zone?

4. Would it have been possible for the jet pilot to have eaten breakfast in New York at 7 A.M., and then to have eaten another breakfast the same day in San Francisco at 7:28 if he made the trip in 3 hours, 28 minutes? Tell why you think he could have or could not have done so.

5. If you were to go from California to New York, would you set your watch forward or backward 1 hour as you entered each time zone? Why?

6. Using the time zones in the picture, find:
a. What time it is in Denver when it is 3 P.M. in New York.
b. What time it is in your home when it is 10 A.M. in Chicago.

7. Do you see that the lines between the time zones are not straight? This is because the people of an entire state choose the time zone for that state.

Why would it not be a good idea for Oklahoma to choose Mountain Time as its standard time?

Speeding Across the Country and Back

Jeff climbed to the top of the tallest hill where he always did his thinking. Today he wanted to think and plan for the time when he would be piloting a rocket ship. He had made up his mind some time ago that he would pilot a rocket ship and try to be the first one to land on the moon.

Jeff took a stick and figured in the dirt the round trip distance across the United States. Check his thinking:

2530 mi.
2530 mi.
5060

Add the ones. 0 + 0 = 0. Write 0 in ones place.

Add the tens. 3 + 3 = 6 tens. Write 6 in tens place.

Add the hundreds. 5 + 5 = 10 hundreds or 1 thousand. Write 0 in tens place, and hold the 1 to add to the other thousands.

Add the thousands. 2 + 2 = 4. 4 + 1 thousand you held from hundreds place = 5. Write 5 in thousands place.

1. Jeff knows it is 1200 miles to his Aunt Jean's home, and it is 600 miles from there to his Aunt Esther's home. He wondered how far he would have to travel if he went to visit both of them. This is the way he wrote the numbers:

1200
600

Can you tell why Jeff has written his figures in the wrong places? Add the figures correctly.

2. Write these numbers in columns, and add (be careful that you get the figures in the right places): 1235, 3490, 500, 165.

3. Add:

a.	b.	c.	d.	e.	f.
987	1047	1285	888	1007	1806
649	852	4373	1075	2085	2793
326	1399	2907	1697	3109	890

Subtraction in Thousands

1. Subtract 1,647 from 4,258.

$$\begin{array}{r} 4258 \\ -\ 1647 \\ \hline \end{array}$$

7 from 8 = 1. Write 1 in ones place.
4 from 5 = 1. Write 1 in tens place.
6 hundreds from 2 hundreds cannot be done.

Use 1 of the 4 thousands to give you 10 hundreds to use with the 2 hundreds you have in 4,258. 6 from 12 = 6. Write 6 in hundreds place.

1 from 3 = 2 thousands; write 2 in thousands place.

Subtract:

a.	**b.**	**c.**	**d.**	**e.**	**f.**
5123	5386	7466	4299	7189	3568
− 1412	− 3256	− 5543	− 1745	− 2744	− 1815

2. Subtract 2,648 from 4,005:

$$\begin{array}{r} 399 \\ 4005 \\ -\ 2648 \\ \hline \end{array}$$

You cannot take 8 ones from 5 ones. You must have more ones before you can subtract them. But you have no tens. Do you remember how you changed hundreds to tens when you needed more tens? There are no hundreds. You must use 1 thousand. Tell how the figures were changed, and finish the subtraction.

Subtract:

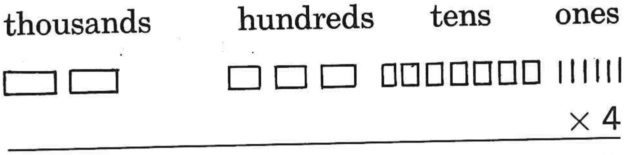
3.	7002	4001	6002	5003	7305	7200
	5734	2901	4008	2785	4459	5700
4.	3960	4208	2680	4058	7072	6400
	2248	1154	1209	2136	2048	2200

5. Write the numbers for these:

a. One thousand four hundred ninety-six.
b. Six thousand one hundred seventy-five.
c. Nine thousand seven.

Multiplying Thousands

2376
× 4 =



2376
× 4
9504

4 × 6 ones = ? ones. What value is held?
4 × 7 tens = ? tens. ? tens + ? tens held = ? tens.

How many hundreds are held? 4 × 3 hundreds = ? hundreds. Add the hundreds held and you have ? hundreds.

How many thousands are held? 4 × 2 thousands = ? thousands. Add the thousand held and you have ? thousands.

Multiply:

	a.	b.	c.	d.	e.	f.
1.	1296 × 5	1024 × 4	1001 × 8	1375 × 4	2500 × 3	1352 × 6
2.	1024 × 7	1042 × 9	1816 × 5	1149 × 8	3566 × 2	1483 × 5
3.	2709 × 3	1007 × 7	1000 × 8	1328 × 4	1976 × 5	3099 × 3

4. Add; do not copy the exercises. Write the answers on your work sheet:

1685 2065 4189	1604 3265 2444	2147 2287 3160	1805 3265 3160	5260 1445 2599	1122 3355 2688

5. Subtract:

3409 2254	4678 2998	5067 3785	6335 4567	5005 2089	4007 2358

At the Air Show

There were all kinds of airplanes at the air show. One of the planes traveled at 375 miles an hour. How far could it travel in 12 hours of flying time?

$$\begin{array}{r}375\\ \times\ 12\\ \hline 750\end{array}$$

2 × 5 ones = 10 ones. Write 0 in ones place, and hold the 1 ten.

2 × 7 tens = 14 tens. Add the 1 ten you held from ones place. You have 15 tens. Write 5 in tens place. Hold the 1 hundred.

2 × 3 hundreds = 6 hundreds. Add the 1 hundred you held. Write 7 in hundreds place.

$$\begin{array}{r}375\\ \times\ 12\\ \hline 750\\ 375\\ \hline 4500\end{array}$$

The 1 in 12 is in tens place. It changes the ones you are multiplying to tens (10 × 5 = 50, or 1 ten × 5 ones = 5 tens).

Do you see why you write the 5 in tens place? Then you finish multiplying by 1 ten. Add to find the answer.

1. There were 2,587 people who bought tickets to the air show on each of the last 3 days. How many people in all saw the air show on these days?

2. Another 1,357 people bought tickets to the air show at the gate on the first day, 1,557 the second day, and 2,499 the third day. How many bought tickets at the gate on these 3 days?

Multiply:

	a.	**b.**	**c.**	**d.**	**e.**
3.	856 15	405 12	600 18	450 13	254 11
4.	150 29	329 56	177 23	428 18	109 15
5.	1059 8	4023 2	2417 4	1275 5	3254 3

Jeff's First Airplane Trip

Jeff is so excited he doesn't know what to do. His grandmother just wrote to him and told him that she is sending the money for him to fly from Omaha to New York City this summer. His mother and father said he could go.

The first thing Jeff wants to know is how fast his plane is going to fly. It is 1,148 mi. from Omaha to New York. It takes 5 hours of flying time to travel this distance.

$$\begin{array}{r} 2 \\ 5\overline{)1148} \\ \underline{10} \\ 1 \end{array}$$

The value of 1 thousand cannot be divided into 5 parts until it is changed into hundreds. You use 11 hundreds in all. Why?

11 hundreds divided by 5 = ? Why is 2 written in hundreds place in the answer? (Do you remember that there is one method in division? Think: How many 5's are there in 11?) 1 hundred is left. Why?

$$\begin{array}{r} 229 \\ 5\overline{)1148} \\ \underline{10} \\ 14 \\ \underline{10} \\ 48 \\ \underline{45} \\ 3 \end{array}$$

1 hundred and 4 tens = 14 tens. How many 5's are there in 14? Do you get 2 with 4 tens left? Where must the 2 be written in the answer?

4 tens and 8 ones = 48 ones. Why is the 9 written in ones place?

The remainder is 3.

The answer is 229 R 3.

Jeff's plane will travel about 230 mi. an hour.

Divide:

	a.	**b.**	**c.**	**d.**	**e.**
1.	$6\overline{)2322}$	$9\overline{)2943}$	$5\overline{)4945}$	$7\overline{)2289}$	$9\overline{)9828}$
2.	$2\overline{)3852}$	$3\overline{)9982}$	$6\overline{)7862}$	$8\overline{)6788}$	$5\overline{)2870}$
3.	$6\overline{)6960}$	$5\overline{)9375}$	$8\overline{)7452}$	$7\overline{)6657}$	$9\overline{)9339}$
4.	$8\overline{)6640}$	$6\overline{)5062}$	$9\overline{)4788}$	$7\overline{)3885}$	$5\overline{)2945}$

Over the Top of the World by Airplane

Jeff's Aunt Ruth is taking the most exciting trip he has ever heard of. She is flying from Los Angeles, California, over the top of the world to Copenhagen, Denmark. From Copenhagen she will fly on to Switzerland.

The air route from Los Angeles to Copenhagen is 5,700 miles. It takes 25 hours of flying time to travel this distance. How many miles per hour does the plane travel?

$$\begin{array}{r} 2 \\ 25\overline{)5700} \\ \underline{50} \\ 70 \end{array}$$

Will the answer be a three- or a four-place number? Why?

5 thousands divided by 25 will not give any thousands. You must use the 5 thousands as 50 hundreds. 50 + 7 = 57 hundreds.

57 hundreds divided by 25 = ? Why must the 2 be written in hundreds place in the answer? How many hundreds are left?

7 hundreds and 0 tens = 70 tens. 70 tens divided by 25 = ? Write 2 in tens place in the answer. Why?

There are 20 tens and 0 ones yet to be divided. 20 tens + 0 ones = 200 ones. Why? 200 divided by 25 = 8. The answer is 228 miles per hour.

$$\begin{array}{r} 228 \\ 25\overline{)5700} \\ \underline{50} \\ 70 \\ \underline{50} \\ 200 \\ \underline{200} \end{array}$$

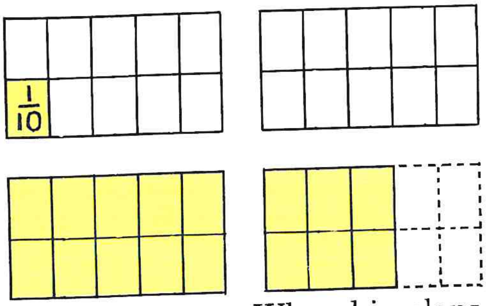
Divide:

	a.	b.	c.	d.	e.
1.	$32\overline{)4096}$	$10\overline{)6450}$	$20\overline{)5840}$	$20\overline{)6690}$	$40\overline{)8880}$
2.	$23\overline{)9982}$	$12\overline{)3852}$	$19\overline{)2831}$	$11\overline{)2915}$	$18\overline{)4734}$
3.	$50\overline{)6500}$	$40\overline{)8960}$	$10\overline{)5700}$	$12\overline{)4200}$	$60\overline{)7320}$

Dividing Thousands by 2-Figure Divisors

Jeff Plans His Rocket Ship

Jeff found the very thing he needs to make a model of his rocket ship. It was sheets of tin that can be bent easily, so that he can mold his rocket ship just as he wants it.

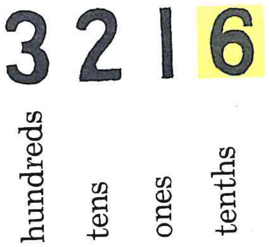


Jeff divided each of 2 whole sheets of paper into 10 equal parts. He knew that each part would be $\frac{1}{10}$ of the whole.

He found that he needs 1 whole sheet and 6 parts of another sheet for a part of his ship. He wrote this as a mixed number on his plans ($1\frac{6}{10}$).

When his plans were finished, Jeff asked his father to look at them. His father asked him why he didn't write his numbers as decimals, but Jeff didn't know what his father meant.

His father then explained how the number system was a system of tens, or **decimals**. He said, "You see it on a speedometer. Let's take $\boxed{321\ 6}$ The 321 tells the number of whole miles and the 6 tells the part of a mile.



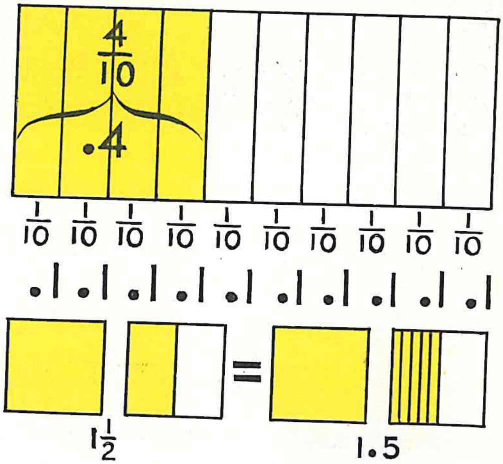
A hundred = 10 tens. (Tens are on the right of hundreds. A ten is $\frac{1}{10}$ of a hundred.)

A ten = 10 ones. (Ones are on the right of tens. A one is $\frac{1}{10}$ of a ten.)

A one = 1. (A 1 is worth 10 in the place on the right of ones, or 1 in this place is $\frac{1}{10}$ of a one. The place is called **tenths**. 1 one = 10 tenths.)

A period is used to separate the ones from parts of one. This period is called a **decimal point**. So, using this system, 3216 = 321.6

Reading and Writing Decimals


$\frac{4}{10}$
.4
$\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$
.1 .1 .1 .1 .1 .1 .1 .1 .1 .1
=
$1\frac{1}{2}$
1.5

$\frac{4}{10}$ is a common fraction. As a decimal fraction, it is .4. The decimal fraction is read just like the common fraction. $\frac{4}{10}$ or .4 is read as 4 tenths.

Sometimes you have a whole and a fraction, like $4\frac{1}{2}$. This is called a mixed number, as you know. When you have one or more wholes and a part of a whole written as a decimal, this is called a **mixed decimal**.

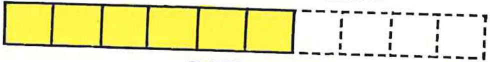
1. Read these decimal fractions:

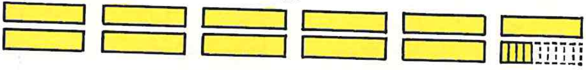
a.	**b.**	**c.**	**d.**	**e.**	**f.**
.8	.4	.9	.6	.7	.5

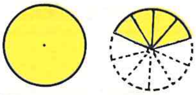
2. Read these mixed decimals (you read mixed decimals as follows: 3.3 is read 3 and 3 tenths, or 3 point 3):

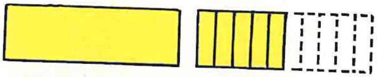
5.8	11.2	37.9	20.3	126.3	108.3
4.6	25.5	6.4	15.7	120.5	200.6

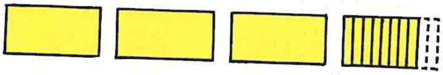
3. Look at these pictures and write the amount shown as decimal fractions or as mixed decimals:

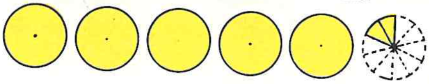
a. six tenths 

b. eleven and four tenths 

c. 

d. 

e. 

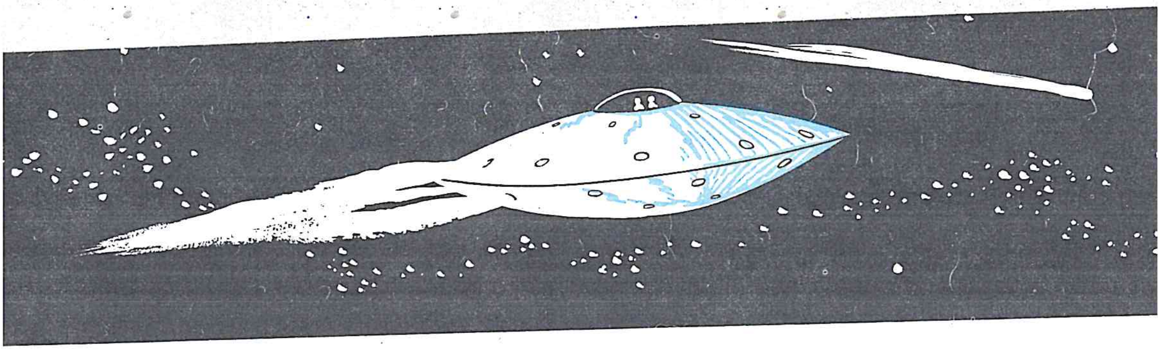
f. 

4. Write these amounts as decimal fractions or mixed decimals:

a. six tenths

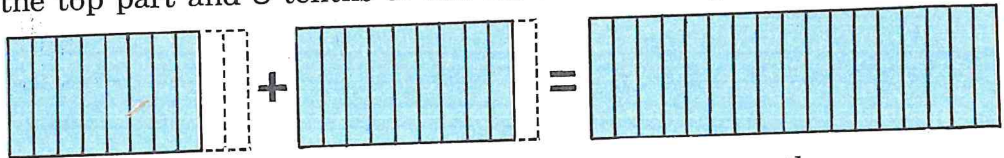
b. nine tenths

c. one hundred thirty-two and seven tenths



The Rocket Ship

Jeff has changed his plans for the rocket ship, somewhat. He found that he must use 9 tenths of a sheet of tin for the top part and 8 tenths of one for the bottom part.



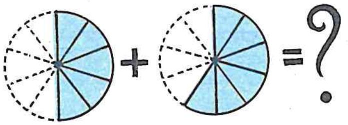
You can see that 8 tenths + 9 tenths = seventeen tenths. Ten tenths = 1 whole; seventeen tenths = 1 whole and 7 tenths or 1.7.

$$\begin{array}{r} .8 \\ +\ .9 \\ \hline 1.7 \end{array}$$

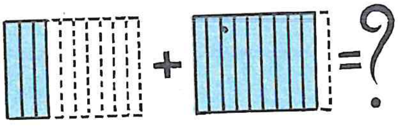
Do you see that you would add tenths as you would any other place values? You must remember to place the tenths in tenths place, the ones in ones place, and put the decimal point in its correct place in the answer.

1. Draw a picture to show how many wholes and how many tenths you have in adding the amounts shown here:

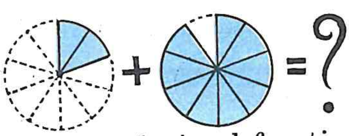
a



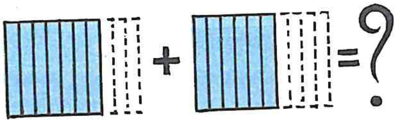
b



c



d

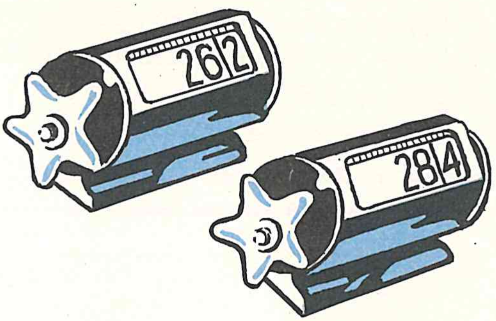


2. Add these decimal fractions:

a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
.6	.7	.2	.2	.5	.9	.7
.9	.8	.8	.9	.7	.9	.6

Seeing the New Plane

Jeff and Douglas are going to the airport to see the new plane. Douglas has a cyclometer on his bike. The mileage reading when they left was 26.2. The picture on the right shows the mileage when they returned. How far did the boys travel?



$$\begin{array}{r} 28.4 \\ -\,26.2 \\ \hline 2.2 \end{array}$$

.2 from .4 = .2
6 ones from 8 ones = 2 ones.
The boys traveled 2.2 miles.

1. Subtract:

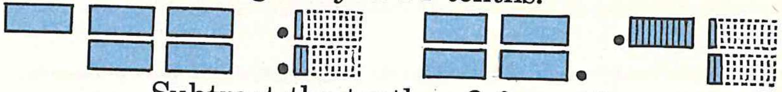
a.	**b.**	**c.**	**d.**	**e.**	**f.**	**g.**
9.5	27.4	75.9	147.8	207.7	96.6	462.4
2.3	6.1	63.6	68.3	183.5	47.3	175.2

Doug and Jeff went to the hobby shop to get the sheets of tin they needed to make their rocket ships. The cyclometer showed that the distance for the round trip to the hobby shop was 3.1 mi. How much farther was a round trip to the hobby shop than to the airport?

$$\begin{array}{r} 3.1 \\ -\,2.2 \\ \hline ? \end{array}$$

You cannot take .2 from .1, so you use a whole 1 to give you 10 tenths; 10 tenths + the 1 tenth you had gives you 11 tenths.

$$\begin{array}{r} 3.1 \\ -\,2.2 \\ \hline \end{array} =$$



Subtract the tenths: 2 from 11 = 9.
Subtract the wholes: 2 wholes from 2 wholes does not leave any wholes. The answer is .9 mi.

Subtract:

2.	9.5	27.4	75.9	147.8	207.7	96.6	462.4
	2.3	6.1	63.6	68.3	183.5	47.3	175.2
3.	74.8	192.1	36.8	465.9	300.7	45.3	99.8
	35.6	75.8	21.2	122.5	156.3	20.1	17.9

Subtracting Mixed Decimals—Tenths

Planning Other Trips on a Bike

Douglas checked the speedometer in his father's car to see how far it was from the park to the lake. He found that it was 8.9 miles.

Several of the boys are going to meet at the park Saturday to ride to the lake on their bikes. How far will the boys ride in a round trip to the lake?

$$\begin{array}{r} 8.9 \\ \times\ 2 \\ \hline 17.8 \end{array}$$

2 × 9 tenths = 18 tenths.

Write 8 in tenths place, and hold 1 whole. Why?

2 × 8 ones = 16 ones; 16 ones + 1 one (held from 18 tenths) = 17 ones. How is the 17 written in the answer?

1. Multiply:

a.	b.	c.	d.	e.	f.	g.	h.
9.1	3.4	5.2	1.8	5.6	7.1	4.3	7.1
7	5	6	8	6	9	2	4

One day the boys rode their bikes 16.8 miles in 3 hours. How many miles per hour did they travel?

$$\begin{array}{r} 5.6 \text{ miles} \\ 3\overline{)16.8} \\ 15 \\ \hline 1\,8 \\ 1\,8 \\ \hline \end{array}$$

16 divided by 3 = 5 with a remainder of 1. Why?

1 whole and 8 tenths = 18 tenths; 18 tenths divided by 3 = 6 tenths. Why?

The boys rode 5.6 mi. per hour.

2. Divide:

a.	b.	c.	d.	e.	f.
$4\overline{)12.4}$	$3\overline{)17.7}$	$5\overline{)26.5}$	$7\overline{)17.5}$	$6\overline{)18.6}$	$13\overline{)27.3}$

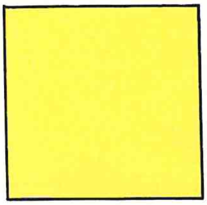
3. Subtract:

25.9	15.2	346.8	123.7	4.5	6.9
− 6.3	− 8.4	− 123.6	− 67.8	− 1.1	− 2.5

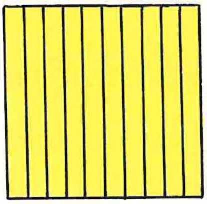
4. Add:

24.1	123.8	45.6	13.9	218.4	45.7
16.8	36.9	17.7	8.8	113.9	17.6

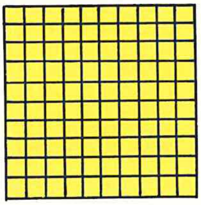
1 Whole



10 Tenths = 1



100 Hundredths = 1



Hundredths

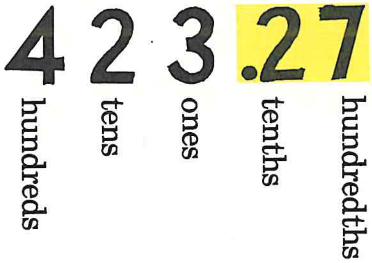
Do you see that a **hundredth** is a tenth of a tenth of a whole? One little square is 1 one-hundredth ($\frac{1}{100}$) part of the whole. Seventy-five of them would give the number $\frac{75}{100}$. But these are common fractions. How would the decimal fractions be written?

Does the following explain how numbers are written?

A one is a tenth of a ten; its place is on the right of tens.

A tenth is a tenth of a one; its place is on the right of ones.

A hundredth is a tenth of a tenth; its place is on the right of tenths. Hundredths place, then, is the second place on the right of ones place.



In reading 3.25, you would say, "Three and twenty-five hundredths," because the 2 tenths = 20 hundredths, and 20 and 5 = 25 hundredths. So $\frac{75}{100}$ is written in decimals as .75.

In reading 3.05, you say, "Three and five hundredths."

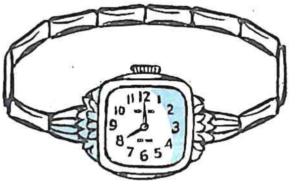
	a.	b.	c.	d.	e.
1. Add:	27.15 16.15	15.10 9.25	16.75 3.67	13.25 12.75	14.50 6.70
2. Subtract:	75.10 15.10	56.17 12.10	28.75 5.25	16.50 8.25	189.90 43.10
3. Multiply:	12.50 × 3	15.75 × 4	10.10 × 7	12.50 × 6	15.72 × 2

	a.	b.	c.	d.
4. Divide:	5)12.50	6)18.66	8)16.88	12)36.00

Using Hundredths

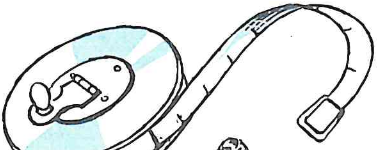
1. Which of these objects do you think required measurement using hundredths of units?

a

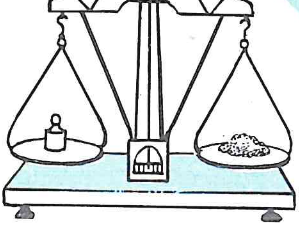


b

c

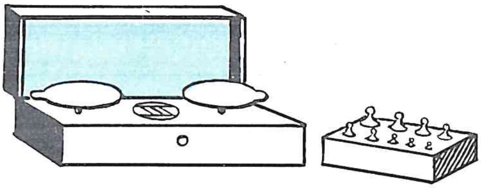


d



e

f



2. You often use hundredths to write sums of money. One cent is 1 hundredth of a dollar (it takes 100 cents to make a dollar). One cent is written \$.01.

Twenty-five cents is written \$.25. You can see that 5 is in hundredths place (5 cents is 5 hundredths of a dollar) and the 2 is in tenths place (2 dimes are .2 of a dollar).

Write these amounts:

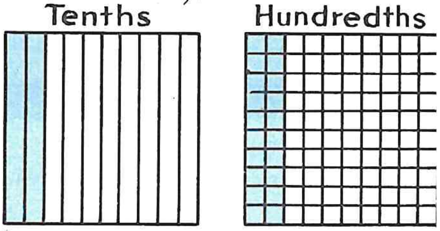
a. One dollar and seven cents.

b. Twelve dollars and eighteen cents.

c. Seven dollars and twenty-five cents.

3. Study this picture:

Do you see that .2 = .20?



4. Draw pictures to prove:

a. .5 = .50 **b.** .3 = .30 **c.** a quarter ($\frac{1}{4}$ of a dollar) = \$.25

Mike Moroney, Pilot

Mike Moroney lives down the street from Jeff and his sister Louise. Louise says that she is going to be an airline stewardess when she grows up.

1. Mike flies a four-motored passenger plane. He told Jeff and Louise that he usually flies 360 mi. an hour, but today a strong wind slowed him down to 325.7 mi. How much slower was this than his usual speed?

2. Mike flies 956 mi. from San Francisco, California, to Denver, Colorado, then 485 mi. from Denver to Omaha, and 1,148 mi. from Omaha to New York. Find the distance he flies from San Francisco to New York.

3. It takes Mike 11 hours of flying time to travel the distance in Problem 2. Find the average number of miles he flies an hour (give your answer correct to tenths of a mile).

4. It costs $108.90 to fly from San Francisco to New York City by tourist flight. Eighteen passengers have reservations. What will be the total cost of their tickets?

5. David and his mother went from Los Angeles to Long Beach by helicopter in 12 minutes. His mother's fare was $6.00. David's fare was half this amount. Find the cost of both tickets.

6. One Sunday David's uncle took him up in a small plane. The plane's wings iced at a mile above the earth. The temperature at that height was 14 degrees. It was 36.6 degrees at the airport. How many degrees difference was there between the two temperatures?

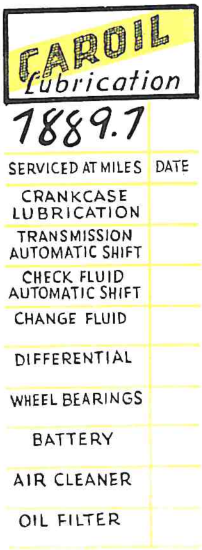
7. Add:

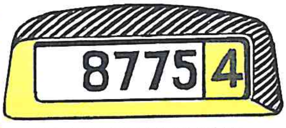
a.	**b.**	**c.**	**d.**	**e.**	**f.**
32.7	18.6	45.1	123.4	18.50	19.20
12.4	10.5	18.6	80.5	21.40	12.40

8. Subtract:

64.9	123.7	45.16	400.86	9.6	8.7
15.4	88.9	8.12	125.46	6.8	1.9

Unit Review





1. Jeff's father asked him to check the speedometer to see if the oil should be changed in the car. Jeff's father has the oil changed every 1,000 miles.

How many more miles may Jeff's father travel before changing the oil?

2. Write the number of miles the speedometer will show when a change of oil is needed.

3. An auto has a tank that holds 14 gal. of gas. Find the cost of a full tank of gas at 29.7¢ per gal.

4. Jeff's father carries 30 lb. of air in each tire. The oil station attendant added 2.8 lb. to one of the tires. What was the air pressure before adding air?

5. Write as numbers:

a. Six thousand five hundred twenty-seven.

b. Two thousand five.

6. Write these in words:

a. 8,745 **b.** 6,001 **c.** 4,034

7. a. How many time zones are there in the United States?

b. What are the names of the time zones?

c. What is the time zone in which you live?

8. Add:

a.	b.	c.
1456	2614	4569
819	1158	1248
2306	5102	1137
1780	1913	2461

9. Subtract:

a.	b.	c.
1877	6408	2006
− 451	− 3619	− 1127

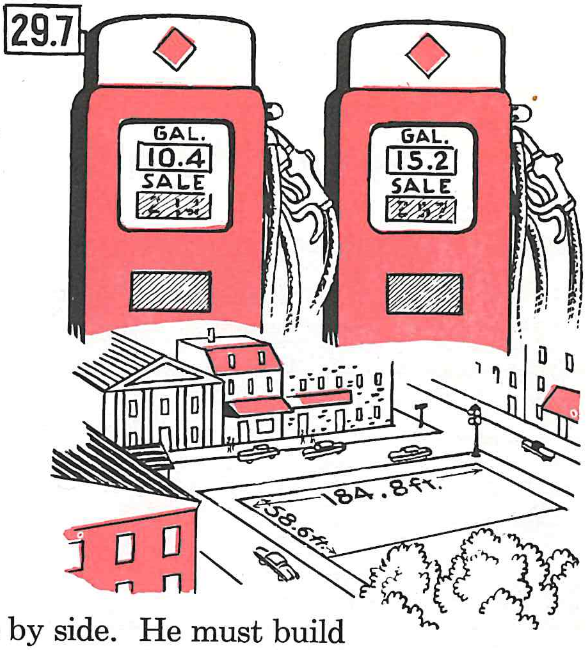
10. Multiply:

1278	1506	7060
× 4	× 9	× 3

11. Divide:

$7\overline{)3754}$ $10\overline{)4560}$ $6\overline{)1074}$

Unit Test



1. Mr. White filled the tank of his car and a can with gasoline. The picture of the first pump shows the amount of gas put in the car. The picture of the second pump shows the amount that was used to fill the can. How much gas was put in the car? in the can? (A gas pump starts at zero.)

2. Mr. White owns a city lot that has a length of 184.8 ft. and a width of 58.6 ft. What is the total distance around the lot?

3. Mr. White bought 3 lots side by side. He must build a sidewalk along the front of these lots. If the widths of the lots are 83.8 ft., 68.6 ft., and 58.4 ft., what will be the length of the sidewalk?

4. Add:

a.	**b.**	**c.**	**d.**	**e.**	**f.**
6.4	24.5	142.3	60.82	36.5	189.24
3.6	16.8	74.9	27.35	12.4	235.16

5. Subtract:

6.8	7.2	22.5	34.2	169.45	120.38
3.5	4.8	16.3	29.6	101.82	80.16

6. Multiply:

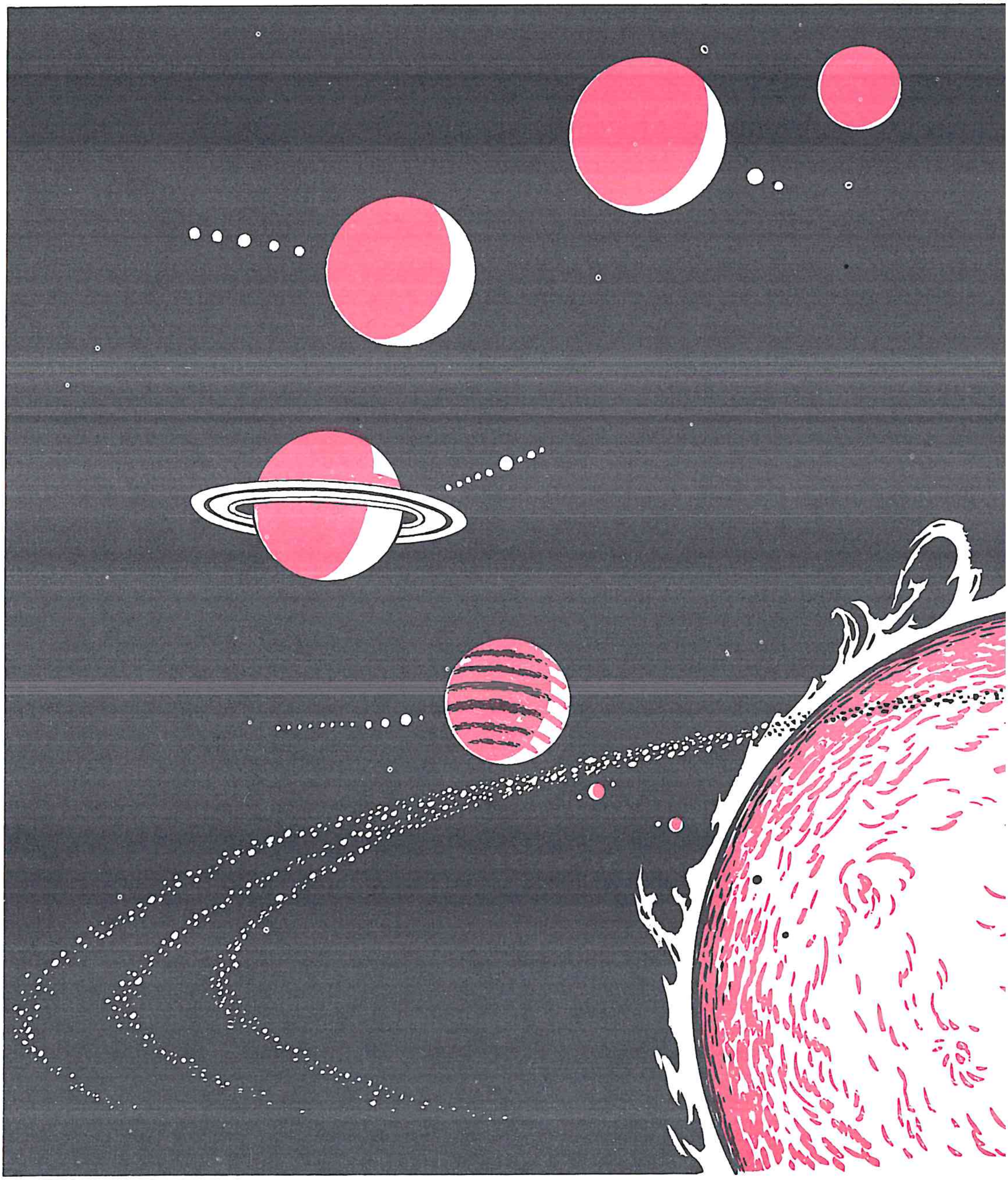
32.4	16.8	42.56	40.32	200.8	365.48
2	6	4	6	7	8

7. Divide:

$4\overline{)48.4}$	$6\overline{)38.4}$	$5\overline{)159.5}$	$3\overline{)440.72}$	$3\overline{)400.5}$	$8\overline{)4095.28}$

UNIT 11

Seeing Bright Worlds in the Sky



Just suppose you are in a rocket ship far out in space and millions of miles from the earth. You might see the fiery mass of the sun around which the nine planets are moving.

The planet closest to the sun is tiny Mercury and then comes bright, cloud-veiled Venus. Next comes Earth with its one moon so large that sometimes Earth and its moon are called twin planets. Then comes reddish Mars with its two tiny moons.

Jupiter is the fifth planet from the sun. You can always tell Jupiter, because it has bands on it and twelve moons revolving around it. Saturn is next with its three rings. Then come Uranus, Neptune, and far away Pluto.

Many of the stars which man has been able to see only a few years because of his improved telescopes are much larger than our sun. The light from some of the more distant stars takes as long as forty years to reach Earth.

Scientists now believe it is very possible for an atomic-powered rocket ship to reach the moon and some of the planets—and in your lifetime!

If you plan a trip to the moon or Mars, what are some of the things you must work out before you go?

Remember that it is very, very hot and very cold on some of the planets. This means you would need a special kind of clothing to protect your body. How could this kind of clothing be invented and tested?

The distances of the planets are so great you would have to know a great deal about arithmetic to figure these distances. How do you suppose the scientists know how far we are from each of the planets and the very great distances to the stars?

Do you know how many a **million** are? Did you ever see a million of anything? Do you think that there are a million stars in the Milky Way?

The Speed of the Earth

Did you ever travel 60 miles an hour in a car? You may not know it, but you are traveling much, much faster than that right now! You are traveling 66,000 miles an hour as the earth travels around the sun.

We are not afraid of running into another planet. Our nearest neighbor, the moon, is 240,000 miles away. We are millions of miles away from any other planet or the sun.

See if you can get an idea of how many a million is.

You know that a sheet of paper is thin. A pile of 500 sheets might be about 2 in. thick. You can get an idea of how many a million is by piling more and more of these sheets on top of each other.

a. 500 sheets would be 2 in. high.

b. 1,000 sheets would be 4 in. high.

c. 5,000 sheets would be 20 in. high.

d. 25,000 sheets would be 100 in. high. (Measure 100 in. and see if it comes to the ceiling of your schoolroom.)

e. 100,000 sheets would be 4 stacks 100 in. high.

f. 1,000,000 sheets would be 40 stacks 100 in. high.

Very large numbers are separated into groups by means of commas. This helps to show the relations and gives an easy way of reading them.

These are the groupings up to and including millions:

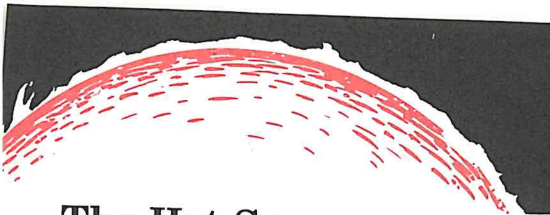
000	000	000
Millions	Thousands	Ones

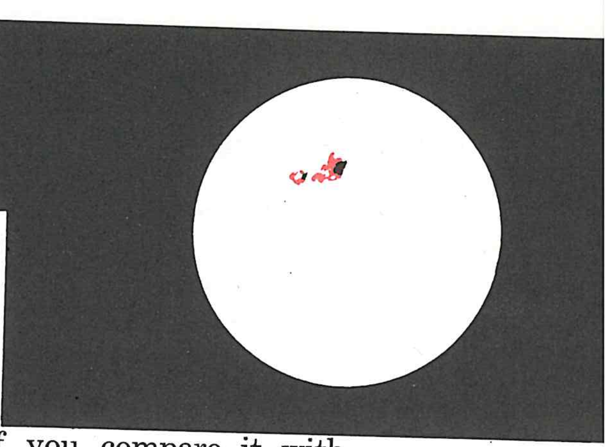
To read the distance to the moon, 240,000 mi., you say, two hundred forty thousand miles (there are no ones). 245,627 is read, two hundred forty-five thousand, six hundred twenty-seven.

1. Read these numbers:
341,000; 156,100; 144,326; 500,000.

2. Read these: 163,428,194; 156,450,380; 145,123,500.

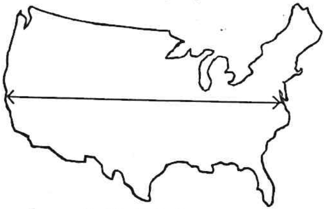
Reading Numbers in Thousands and Millions





The Hot Sun

The sun is about 93,000,000 miles from Earth. This is a great distance, don't you think? Do you suppose you could get some idea of how far this is if you compare it with distances on Earth?



It is about 2,500 mi. across the United States.

It is about 25,000 miles around the earth at the equator.

Four times the distance around the earth = 100,000 mi. Forty times = 1,000,000 mi.

How many times would you have to travel the distance around the earth at the equator to give 93,000,000 mi.?

1. Read this number: 93,000,000 (there are no thousands or ones).

Read the following values:

	a.	**b.**	**c.**	**d.**
2.	4,780 ft.	50,000 sq. ft.	128,000 gal.	600,400 gal.
3.	15,648 mi.	40,200 sq. ft.	266,400 bu.	788,700 bu.
4.	$1,250,460	$624,470,519	$15,200,000	$86,750,100

5. Tell the groups in the following numbers:

a. The sun has a diameter (distance through the center) of 864,000 miles.

b. If the sun were hollow like a rubber ball, it would hold more than 1,000,000 Earths and still have space left over.

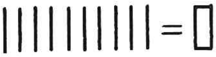
Practice in Reading Large Numbers

Understanding More about Large Numbers

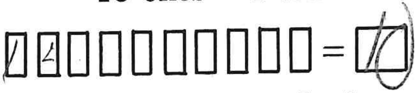
Look at the number 165,412,856. You know that the figures 856 are the ones group, the figures 412 are the thousands group, and the figures 165 are the millions group. It is read: one hundred sixty-five million, four hundred twelve thousand, eight hundred fifty-six.

Millions			*Thousands*			*Ones*		
1	6	5	4	1	2	8	5	6
hundred-millions	ten-millions	millions	hundred-thousands	ten-thousands	thousands	hundreds	tens	ones

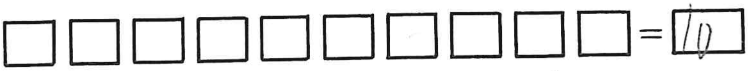
Do you also see that each group, such as thousands, has its own place for ones, tens, and hundreds of thousands?



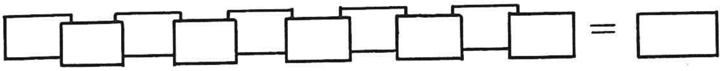
10 ones = 1 ten



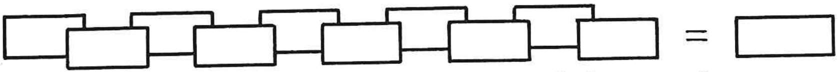
10 tens = 1 hundred



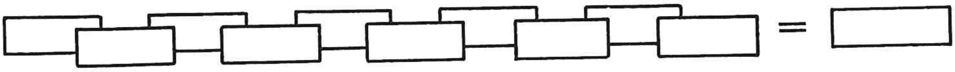
10 hundreds = 1 thousand



10 thousands = 1 ten-thousand



10 ten-thousands = 1 hundred-thousand



10 hundred-thousands = 1 million

The Moon

The moon will be a very interesting place to visit. Divide your weight by 6, and you will find that you will weigh only 10 or 15 pounds on the moon. You can jump 6 times farther than you can on earth.

You will want to be sure to land on the moon while it is daylight there. Nighttime lasts 2 weeks, while the heated side is turned away from the sun, and temperatures drop to 200 degrees below zero.

Ted read that some of the craters on the moon were believed to be one million, twenty thousand feet from one rim to the other rim.

Ted wanted to write this number in figures. The first thing he did was to make nine short lines and separate the ones from the thousands and the thousands from the millions by commas: ___,___,___(__1, 020, 000).

Ted knew that there was 1 million, so he wrote 1 in millions place. He wrote it in ones place in the millions group because he had less than 10 million.

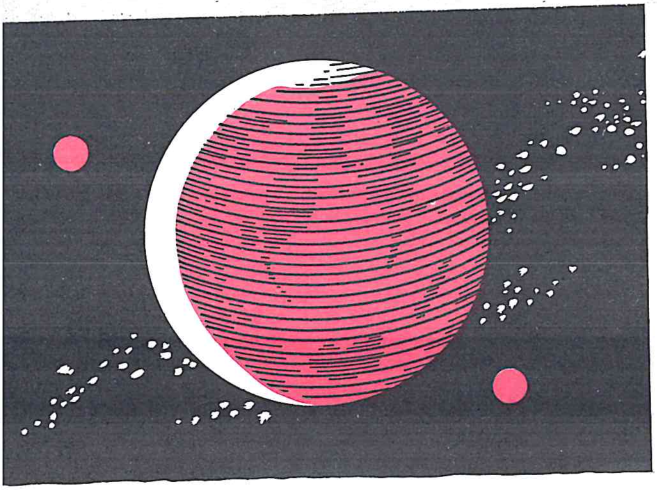
He knew that twenty thousand is less than a hundred thousand; so he wrote 020 to show he had no hundred-thousands.

He had no ones numbers, so he filled the places in this group with zeros. He had to do this to show place values.

1. Write these: **a.** one million, four hundred fifty-six thousand, eight hundred; **b.** sixteen million.

2. The moon has mountains that are twenty-one thousand, one hundred twenty feet high (write in figures).

3. The light from the moon travels one hundred eighty-six thousand miles a second, or eleven million, one hundred sixty thousand miles in an hour (write both distances in figures).



Mars

This is Mars. There may be life on Mars as there is on our Earth. Scientists believe that an atomic-powered rocket ship can be made which may take people to Mars in your lifetime. Would you like to go?

1. Mars has 2 moons. One moon is about 25,400 ft. in diameter (distance through it), and the other is about 24,600 ft. Find the difference in the diameters of the moons.

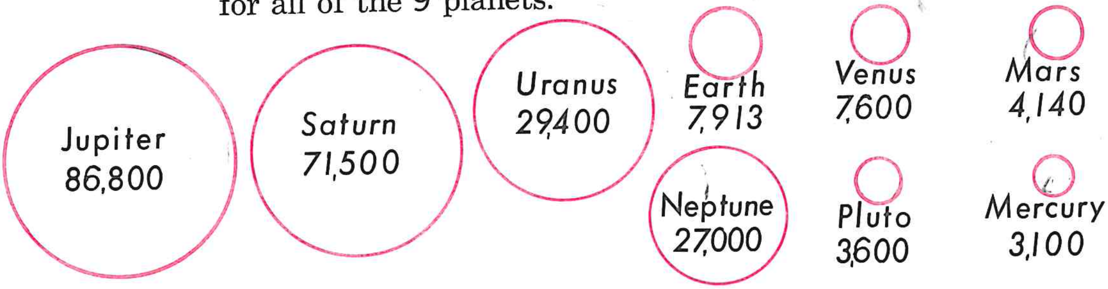
$$\begin{array}{r} 25{,}400 \text{ ft.} \\ -\ 24{,}600 \text{ ft.} \\ \hline \end{array}$$

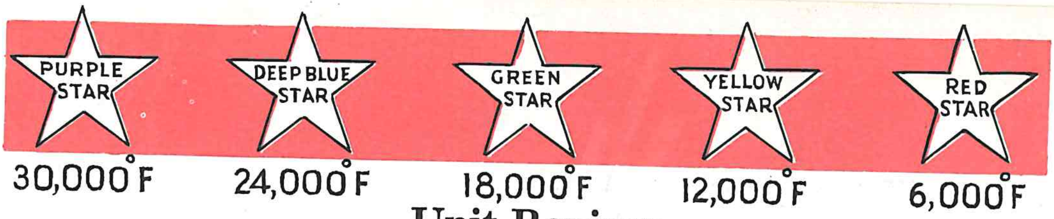
2. One of the moons is 3,700 miles from the center of Mars. The other is 14,600 miles from its center. Find the difference between these distances.

3. On its way around the sun, Mars sometimes comes as close as 35,000,000 mi. to Earth. The farthest distance it gets from Earth is 234,000,000 mi. Find the difference in the number of miles from the point at which Mars is nearest and the point at which it is farthest from Earth.

4. Mars is 142,000,000 miles from the sun. Earth is 93,000,000 miles from the sun. Which is nearer to the sun, Earth or Mars? How much nearer?

5. The diameter of the 9 planets is given as the number of miles at the equator. Find the total number of miles for all of the 9 planets.





Unit Review

Not all stars are yellow. Their color depends on the temperature and age of the stars. The red stars are those that are old and cooling.

1. Tonight Jack saw three purple stars through a pair of field glasses. Find the total temperature of the three stars.

2. His sister pointed out a red star and a deep blue star. What is the total temperature of these 2 stars?

3. What is the difference in temperature between a yellow star and a purple star?

4. Light travels 11,160,000 miles a minute. Find how far it travels in a half hour.

5. An airplane (DC6) that weighs 59,817 lb. on Earth would weigh $\frac{1}{4}$ as much on Mercury. Find its weight on Mercury. $\frac{1}{4} \times 59{,}817$ lb. = ?

6. Add: **7.** Subtract:

6. a.	6. b.	7. a.	7. b.
426,296	$76,258.25	609,284	$68,298.40
1,256,973	4,960.48	85,795	8,769.80
58,788	898.57		

8. What are the place values in the following?

20,675 1,300,206 100,000 4,004,004

9. What figures in the number 6,023,756 tell thousands?

10. Write these numbers in figures: **a.** Forty-six thousand, seventy-six **b.** One hundred eight thousand **c.** One million, thirty-eight thousand, four hundred twenty-three.

11. Read these numbers:

142,277 4,387,456 9,705 109,000,000

Unit Test

1. These are the distances to the sun from the 6 planets closest to the sun. Write the planets in the order of their nearness to the sun, putting the one nearest the sun first:

Earth, 93,000,000
Venus, 67,000,000
Saturn, 886,000,000
Jupiter, 483,000,000
Mercury, 36,000,000
Mars, 141,000,000

2. A jet plane travels 759 miles an hour. How far can it travel in 12 hours?

3. It costs $126.23 for an adult's fare from Chicago to Los Angeles by airplane. A child's ticket is half this amount. Find the cost of tickets for 14 adults and 6 children on a plane.

4. Pluto was discovered in 1930. How many years have passed since that time?

5. It takes 4 years for the light from the nearest star to reach the earth. How many days is this?

6. Add:

a.	**b.**	**c.**	**d.**
123,567,000	45,600,781	54,671	5,781
451,667,342	81,754,132	67,181	18,456

7. Subtract:

147,500,000	677,895,468	5,008	18,560
67,400,000	124,451,300	1,459	13,488

8. a. What figures of 75,384 are in the ones group?

b. What figures of 26,006,275 are in the millions group?

c. What figures of 6,383,628 are in the thousands group?

9. Read the following numbers:

26,035 404,260 8,230,600 12,012,012

10. Write these in numbers:

a. Two hundred nine thousand, four hundred six.

b. Six thousand, four hundred fifty-eight.

Tables of Measures

Liquid Measures

2 cups (c.) = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

Dry Measures

2 pints = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Weight Measures

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2000 pounds = 1 ton (t.)

Length Measures

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
36 inches = 1 yard
$5\frac{1}{2}$ yards = 1 rod (rd.)
$16\frac{1}{2}$ feet = 1 rod
320 rods = 1 mile (mi.)
5,280 feet = 1 mile

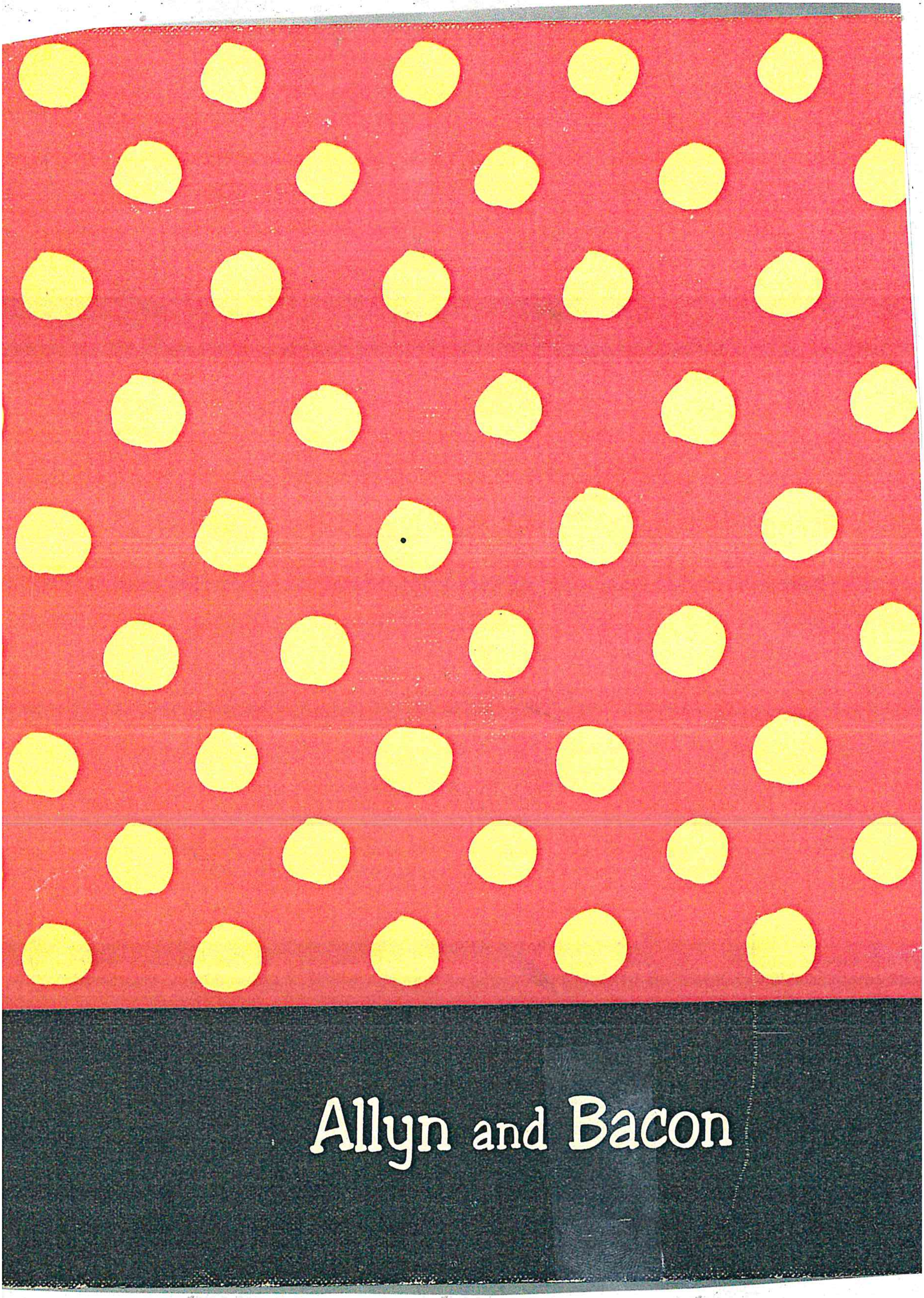
Time Measures

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
52 weeks = 1 year (yr.)
12 months = 1 year
$365\frac{1}{4}$ days = 1 year
10 years = 1 decade
100 years = 1 century

Square Measures

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)
640 acres = 1 square mile (sq. mi.)

Index pages (332 to 336) not required. This is the last page.



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